

ELECTRICAL CONSTRUCTION AND MAINTENANCE

DECEMBER • 1950

50th Year

Controls

Safe wiring for intricate controls in hazardous areas.

Washington Roundup

Latest reports on controls and allocations affecting electrical work.

Methods

For wiring jobs; Code questions and motor repair shop practices.

and Featuring

Caterpillar of Peoria

An outstanding industrial electrical construction project of special interest.

A
McGRAW-HILL
PUBLICATION



FLOODLIGHTS

for 95% of your jobs

STOCKED FOR QUICK PICK-UP

SPORTS AND AREA LIGHTING

Type L-69

1000-1500 watt

Alzak® processed
aluminum
spun-sealed—
enclosed
Wide, medium
or narrow beam



AREA LIGHTING

TYPE L-45

300-1500 watt

Porcelain
enamel
Open—
Wide beam



*Alzak® aluminum adaptor available for
concentrated beam*

GENERAL PURPOSE

Type L-82 500 watt

Type L-83 1000 watt

Alzak® processed
aluminum
Hinged door—
enclosed
Narrow or
wide beam



HANDY FLOODLIGHT

Type L-66

200-300 watt

Wide beam—
aluminum
Clamp-ring
door—
enclosed



HANDY FLOODLIGHT

Type L-65

100-150 watt

Wide beam—
aluminum
Snap-ring
door—
enclosed



LAMP HOLDER

Type L-65-P

Takes 150 watt Par 38

spot or
projector
floodlight
(not furnished)



For 95 per cent of your needs these General Electric floodlights will do the job—and they are immediately available from your G-E distributor's shelves.

For the other 5% of your floodlighting contracts—swimming pools, fountains and similar specialized applications—there are other General Electric floodlights specifically made for the job. Your G-E distributor can give you all details and get you prompt delivery.

All General Electric floodlights are designed for quick installation and easy maintenance. With G-E floodlights installed, you can accept maintenance contracts with confidence.

See your General Electric distributor for the floodlight that's right for your job.

*Manufactured under Aluminum Company of America Patents.



YOURS FOR THE ASKING—This manual contains floodlighting plans for all popular outdoor sports. It's complete—right down to lists of materials. You'll find it a handy reference. Just ask for GET-1284C. Apparatus Department, General Electric Co., Schenectady 5, New York.

GENERAL  ELECTRIC

451-146

Nothing could be Easier

Murray Circuit Protectors

are EASY TO INSTALL



FOUR SIMPLE STEPS



1

Mount box. If additional breakers are needed, simply snap in under spring clips.



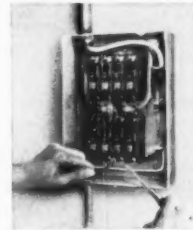
2

Insert screws in top and bottom terminals of each breaker.



3

Connect up mains to solderless terminals and neutral.



4

Connect up branch circuits to breakers and neutral. Snap on cover and the job is done.

Each breaker is fully magnetic — never needs "derating."
No thermal unit — never tripped falsely by heat.
Safe — Convenient — Economical.
Approved for use as service equipment.

No main switch required for the "8" when handle extensions are used.

The Murray Circuit Protector Load Center, like all Murray products, is designed for simple, easy installation and wiring. Knock-outs are quickly punched clean. The box has plenty of working space inside. Bussing is placed just right for accessibility. Solderless connectors tighten up on the wires in a matter of seconds.

IF YOU WANT TO INSTALL THE BEST
...SPECIFY *Murray*



MURRAY MANUFACTURING CORPORATION
1250 ATLANTIC AVENUE • BROOKLYN 16, NEW YORK

Write for new descriptive folder

Service Entrance
and Meter Equipment

Safety Switches

Current Limiting Reactors

Crows' nest Aerial Ladders



It's Here!

... a Great **NEW**
APPLETON REELITE

■ Announcing the new, *all new*, Appleton 75 Portable Reelite—a compact, automatic cord take-up reel that solves the countless lighting problems of car-loading, machine inspection, maintenance work—any job that requires good illumination in out-of-the-way places.

Double silver alloy collector brushes—one of many outstanding new features—permit continuous rotation of the entire reel in either direction without power interruption or tangling of the cord. This versatile device furnishes light—or a flexible power source for power tools—when and where you want it. Positive stop action holds cord at desired length, up to 25 feet; then cord is automatically re-reeled when job is done.

The Appleton 75 Portable Reelite is completely encased in steel, finished in baked hammertone enamel. It is easily installed on any 4" octagonal outlet box. Available accessories include six types of handlamps, machine tool connector body or key socket. A vaporproof model is furnished with handlamp. Write for details on this and other Portable Reelites.



270
Pat.
Applied For

Rating:
10A-250V.

Shown above is the New Appleton 75 Series Portable Reelite. At right, the new reel equipped with RE-H358 handlamp.



Sold Through Electrical Wholesalers

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1704 WELLINGTON AVENUE • CHICAGO 13, ILLINOIS

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APPLETON

CONDUIT FITTINGS • LIGHTING EQUIPMENT • OUTLET AND SWITCH BOXES • EXPLOSION-PROOF FITTINGS • REELITES

ELECTRICAL CONSTRUCTION AND MAINTENANCE

With which is incorporated Electrical Contracting, The
Electrical and Electrical Record . . . Established 1901

Published for electrical contractors, industrial electricians, engineers, consultants, inspectors and motor shops. Covering engineering, installation, repair, maintenance and management, in the field of electrical construction and maintenance.

50th Year — DECEMBER, • 1950

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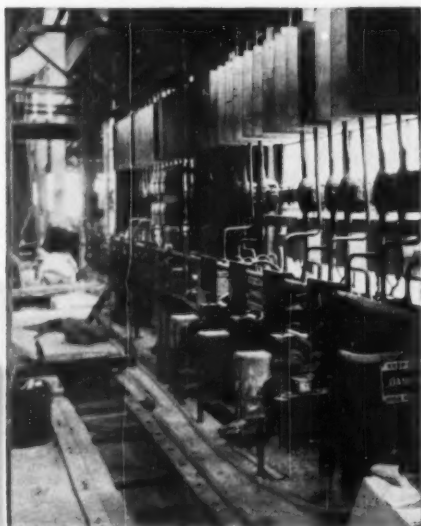
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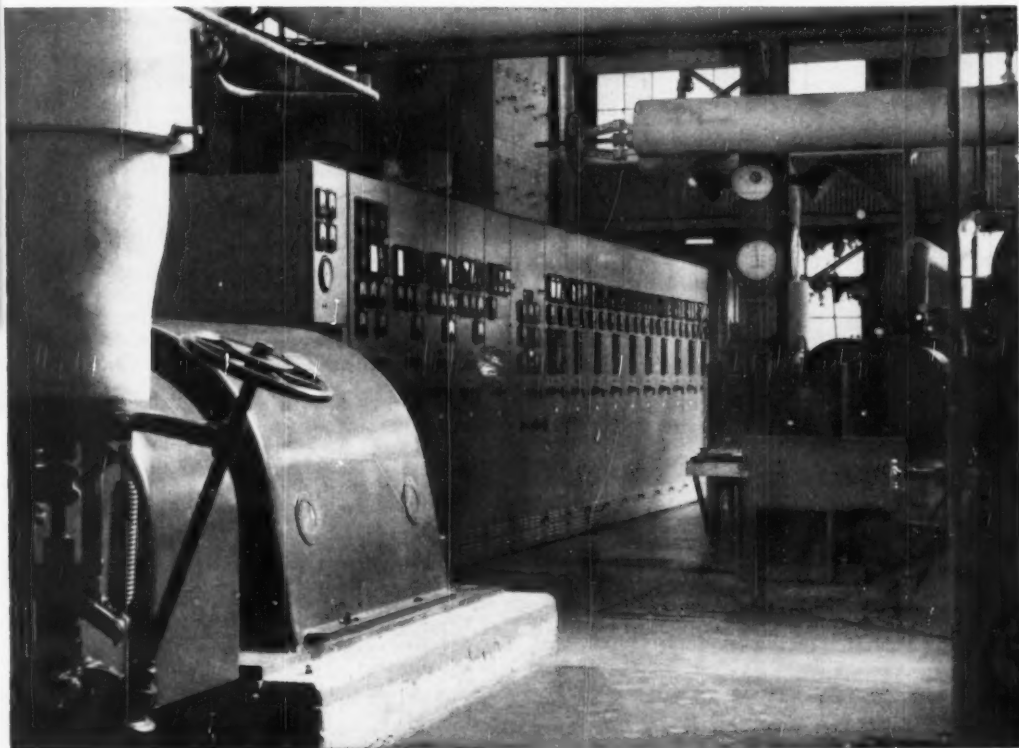
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FREEPORT SULPHUR EXPANDS



This inadequate, open-type switchgear was replaced by the new G-E Metal-clad equipment shown below. Freeport Sulphur officials recognized that the old switchgear had outgrown its usefulness.

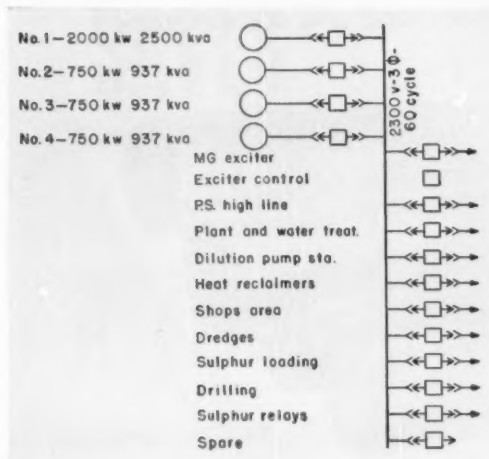
Here's the new General Electric 5-kv Metal-clad switchgear installed at Freeport Sulphur. Magne-blast power circuit breakers have plenty of "IC" (Interrupting Capacity) to handle all short circuits that may occur on Freeport's expanded distribution system. This assures continuous power for vital production.



AND MODERNIZES WITH

METAL CLAD

SWITCHGEAR



This one-line diagram shows power distribution at Freeport Sulphur as planned by Sargent and Lundy, consulting engineers of Chicago. General Electric Metal-clad switchgear handles the 2300-volt power from the generators through power circuit breakers of 100,000-kva interrupting rating.

The Freeport installation is a complete General Electric project—one source of responsibility plus the very best in co-ordinated planning, engineering, manufacturing, and service facilities to give maximum savings and efficiency to the customer.

Be sure to see the "More Power to America" full-color sound slide-film "Modern Industrial Power Distribution." Ask your G-E sales representative to arrange a showing for your organization.

WHEN Freeport Sulphur expanded their production facilities they put in a new turbine to take care of the increased load.

At the same time they replaced all their old equipment with General Electric switchgear.

When you order G-E switchgear you get all the equipment and service from one reliable source. And with everything pre-assembled at the factory it takes very little time to get the switchgear in place and operating.

MODERN INDUSTRIAL power distribution systems using G-E switchgear are applicable to any industrial plant or commercial building where you want. . . .

- Proper voltage for top performance of equipment
- An extremely flexible setup to take care of expanding or changing loads
- Adequate short-circuit protection
- Protection for personnel
- Low installation and maintenance costs

INVESTIGATE TODAY the many advantages of using General Electric switchgear to get the same benefits gained by Freeport Sulphur. Contact your G-E sales representative for further information—or write for the helpful bulletins listed below. *Apparatus Department, General Electric Company, Schenectady 5, New York.*

GEA-3083 Metal-clad Switchgear

GEA-4966 Low-voltage Metal-enclosed Switchgear

GEA-3592 Load-center Unit Substations

GEA-3758 Load-center Power Distribution

GENERAL ELECTRIC

Call your Central Conduit distributor

HE HANDLES
THESE *Four*
Famous Raceways



Your Central Conduit Distributor handles quality products. That's why he sells and recommends Central Rigid Steel Conduit. It's made in four different types to provide you with an electrical raceway that will exactly fit your needs.

Cenlaco has a hot dipped galvanized and lacquered finish. **Central White** has an electro-galvanized outside finish and a black enameled inside finish. **Central Black** has a permanent, baked-on enamel finish inside and out. **Central EMT** is a light-weight conduit with an electro-

galvanized outside finish and has a durably lacquered inside finish.

In addition to quality products, you can depend on your Central Conduit Distributor for friendly service. He'll go out of his way to see that you are fully satisfied.

Unprecedented demand has made it impossible at times for him to always completely fill your orders immediately. But keep in touch with him. He will make sure that you get a fair share of his supply.

SPANG-CHALFANT

Division of The National Supply Company

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CENLACO a hot dipped galvanized and lacquered finish, inside and out.

CENTRAL BLACK permanent, baked-on black enamel finish, inside and out.

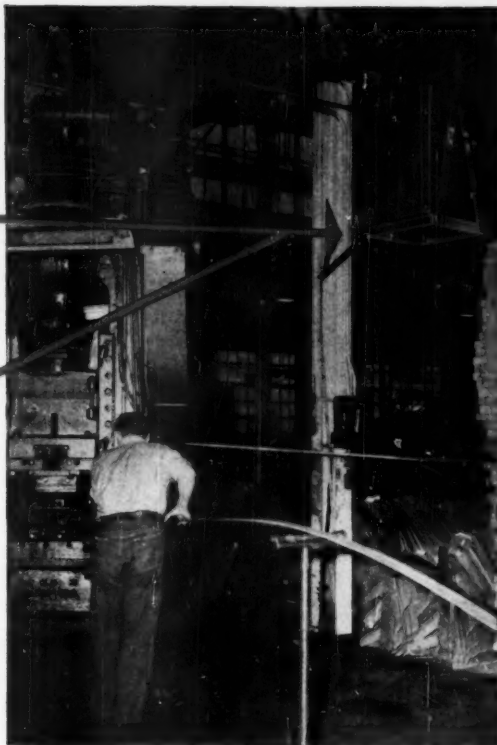
CENTRAL WHITE electro-galvanized outside and black enameled inside.

EMT—Light-weight electro-galvanized outside and durably lacquered inside.

WITH CAPACITORS

\$1907⁰⁰

HERE
SAVES
\$2700⁰⁰
A YEAR



COMPLETELY PAID OFF IN EIGHT MONTHS—that's the experience the Empire Plow Company of Cleveland, Ohio, had when they installed two 90-kvar and two 30-kvar banks of General Electric capacitors on their power distribution system.

The power factor had been down to a money-wasting 61%. After the capacitor installation it rose to better than 97%. With new power rates becoming effective—rates that contained a power-factor penalty clause—improvement in power factor meant real savings in the power bill. The entire installation—capacitors, switches and labor—cost \$1907. The savings have been \$2700 in the first year alone.

DO THESE FIGURES SOUND GOOD? A quick check of your own power factor may show that you can do the same. If your power factor is below 85%, chances are you can

make worthwhile savings—especially if there is a power factor or demand clause in your power contract. Also, capacitors will usually improve voltage conditions, allow for expansion of your electrical load, and relieve feeders and transformers of overload.


Your nearest G-E Apparatus office can help you determine just what savings G-E capacitors will make for you—and what improvements in voltage and overload conditions. Meanwhile, read what capacitors have done for others. Write for a copy of GEA-5167, "A Way to Cut Power Cost." Address Apparatus Dept., General Electric Company, Schenectady 5, N. Y.



This New Book Can Help You

"Capacitors for Industry" is a new, complete book on the application of capacitors in industrial installations. Full of up-to-date information, it is the work of four General Electric application and

design engineers. "Capacitors for Industry" is the newest member of the General Electric-Wiley book series. Copies may be purchased from John Wiley and Sons, Inc., 440 Fifth Avenue, New York.

You can put your confidence in—
GENERAL  ELECTRIC

407-198



Lend An Ear to Mr. Roth...

Inventor of 'Flashcast' Equipment Solves Voltage Problems with G-E Transformers



"Our entire equipment, including sign lamps, selector, and rotor is supplied by General Electric transformers," states Mr. Roth, shown above. "Incidentally I've been a G-E customer for more than 35 years."



Day-in and day-out these signs operate at constantly varying loads of from 11 to 34 kv. "It takes dependable G-E dry-type transformers to keep my costs down," says Mr. Roth, Trans-Lux vice-president.

"Lighting up the big 'flashcast' sign on New York's Times Square gave us a real problem in voltage control," says Mr. B. W. Roth, inventor, and vice-president of the Trans-Lux News Sign Corp., New York City.

"Normally I simply use a dry-type transformer to step down 220 volts to 110 for my flashing equipment and an 11 1/2-volt General Electric 'BB' (Boost-Buck) transformer to step down lamp voltage for increased lamp life.

"But on this job, strong sunlight made the sign almost illegible during the day. Solution? Easy. I use the standard G-E 11 1/2-volt transformer to boost voltage for *increased* lamp brilliance during the day, reversing connections to buck voltage for *decreased* brilliance at night."

NOW LET YOUR Eye TELL YOU HOW TO BUY DRY-TYPE TRANSFORMERS...

Take a good look at G-E dry-type transformers. Note their distinctive functional appearance. You'll see that they are designed to dissipate heat rapidly—built for years of reliable service.

Specify General Electric dry-type transformers. You'll be pleased with the long life and economical performance. For more information see your local electrical distributor, or contact your nearest G-E Sales Office. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

You can put your confidence in—

GENERAL  ELECTRIC

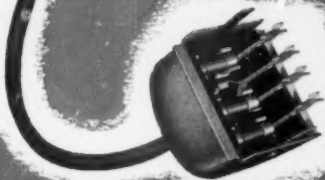
411-461



GE DRY-TYPE TRANSFORMERS

Type M — for 25 to 10 kva (indoors or outdoors)
Type B — for 15 kva and above (indoors)

**For Greater
Production
Efficiency...**



POWER PLUG IN

**The Midget Size Busduct, Now Available
For Three Phase, Four Wire Service**

Ⓐ Power Plug, the midget size Busduct is the answer to today's demand for greater plant production efficiency. Available now for 4 wire 3 phase service, 3 wire 3 phase service and 2 wire, single phase.

Ⓐ Power Plug provides convenient plug-in outlets all along the line, permitting machines to be moved in and out of production lines without slowing down or delaying operations.

Ⓐ Power Plug provides 50 amp., main feeder capacity for $\frac{1}{2}$ to 3 H.P. 240 volt motors, AC or DC, with conventional type fuses, and $7\frac{1}{2}$ H.P. maximum with dual element fuses. In its new design

Ⓐ Power Plug also provides 208 volts single phase or three phase

for power to motors, and 120 volts for light where individual illumination on machines is desirable. It also provides 120 volts for small pump motors on return lubrication systems.

Underwriters' Laboratories approved, Ⓐ Power Plug is only $3\frac{1}{2}$ inches wide and 2 inches deep in size. It is available in 5- and 10-foot sections with plug-in outlets every 20 inches; additional outlets on special order. Special lengths are also available for application on production benches and machines.

For further information on this new, convenient, flexible and efficient system of power distribution contact your nearest Ⓐ representative (he's listed in Sweet's) or write for Bulletin No. 704.



Frank Adam Electric Co.

ST. LOUIS 13, MISSOURI

Makers of BUSDUCT • PANELBOARDS • SWITCHBOARDS • SERVICE
EQUIPMENT • SAFETY SWITCHES • LOAD CENTERS • QUICKMETER

It's easier to work *the Inch-Marked way*



With Inch-Marked,* threadless ELECTRUNITE E.M.T., there's no danger of losing expensive thread-cutting tools on the job. Simple, one-piece ELECTRUNITE Benders, end wrenches or pliers, and a back saw are all that's needed by an experienced electrician to put in a strong, rain- and concrete-tight ELECTRUNITE raceway installation.

with **ELECTRUNITE** **E. M. T.**

Here's a proved installation advantage found *only* on Republic ELECTRUNITE E.M.T.—the *original* lightweight rigid steel raceway for modern wiring jobs. It's Inch-Marking—on every length of ELECTRUNITE E.M.T. in $\frac{1}{2}$ ", $\frac{3}{4}$ " and 1" sizes.

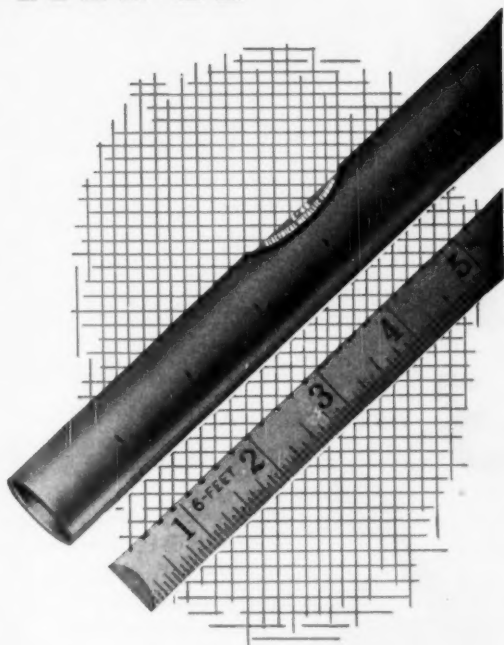
With Inch-Marked* ELECTRUNITE E.M.T., workmen can measure bending and cutting distances in an instant without the need for a rule or tape.

Yet, Inch-Marking is but one of many advantages which make jobs go in easier and smoother with modern ELECTRUNITE E.M.T. Uniformly high ductility, knurled inside surface, light weight and freedom from tedious thread-cutting all combine to make ELECTRUNITE E.M.T. the outstanding buy in the raceway field.

To get the *complete* story about this modern code-approved material, see your nearest ELECTRUNITE Distributor, or write today to:

REPUBLIC STEEL CORPORATION
STEEL AND TUBES DIVISION • CLEVELAND 8, OHIO
Export Department: Chrysler Building, New York 17, N. Y.

*Reg. U. S. Pat. Off.



"As accurate and easy to read as a folding rule," say workmen who have used and now insist upon Inch-Marked* Republic ELECTRUNITE E.M.T.—the raceway that was designed with the electrician in mind.



Republic
ELECTRUNITE E.M.T.

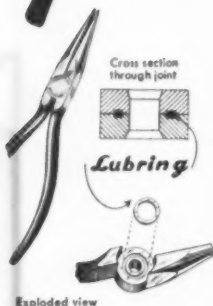
LIGHTWEIGHT THREADLESS RIGID STEEL RACEWAY

NEWS FROM UTICA

Pioneering and improvements it will pay you to know about

1

PLIERS WITH BUILT-IN LUBRICATION . .



The finest pliers—the LUBRING line—have a ring of oil-impregnated porous iron floating in the joint. The ring slowly feeds lubrication and assures smooth action, long life. Standard equipment for several top utilities.

2

NEW SAFETY AND COMFORT IN SPECIAL HANDLES

Heavy rubber vulcanized handles for insulation—slip-on plastic handles that are non-burning, non-explosive—dipped plastic handles for comfort—handle springs for ease in use. For almost all UTICA tools.



3

WRENCHES THAT LAST TEN TIMES AS LONG . .



Adjustable wrenches with electronically hardened jaw surfaces. Resist burring and nicking. Last up to 10 times as long. Their thin pattern was designed to reach the hard-to-get-at places—with plenty of strength!

4

80 TOOLS . . 151 SIZES. THE RIGHT TOOL FOR YOUR NEED

You get *exactly* what you want from UTICA! A full line of pliers and adjustable wrenches. Every tool checked in every step of manufacture, and *tested*. For long-run economy in your production line.



Utica Drop Forge & Tool Corporation, Utica 4, N. Y.

BETTER PLIERS FOR EVERY PURPOSE

It pays to use

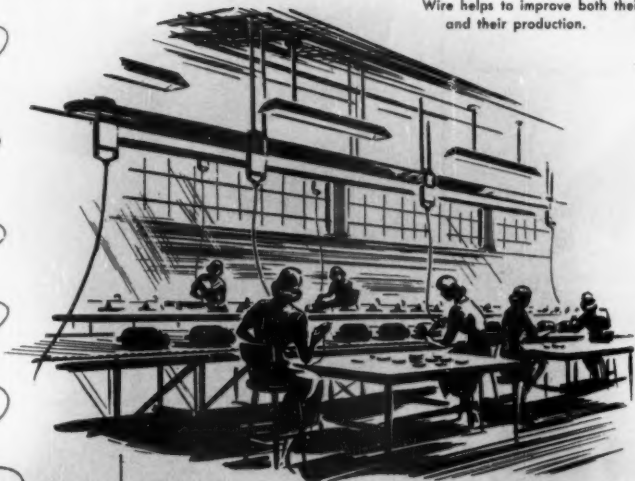


quality tools

AND THE WORLD'S BEST TOOLS ARE MADE IN U. S. A.

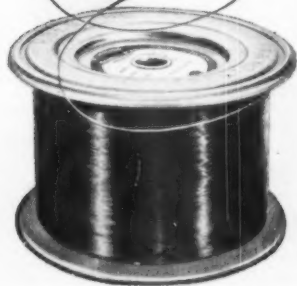
ELECTRICAL CONSTRUCTION AND MAINTENANCE . . . DECEMBER, 1950

A rapidly increasing number of electrical manufacturers are finding that ROEVAR Magnet Wire helps to improve both their product and their production.



Insulation that's 10 to 40 times tougher...that's why

Today it's Roebling!



PUT ROEVAR MAGNET WIRE to the test and you'll find it's 10 to 40 times more resistant to abrasion than regular enamel insulation. And outstanding toughness like that speaks for itself . . . ROEVAR is obviously today's best choice for high speed winding.

But besides that, ROEVAR Magnet Wire insulation stretches and bends to an exceptional degree. It has high resistance to baking temperatures and to the solvents in coil-treating varnishes . . . the stamina for thoroughly dependable service.

ROEVAR Magnet Wire has a better space factor than magnet wire with fibrous insulation. *It costs less, too!* Comes in sizes No. 14 and 40 A.W.G. Try ROEVAR . . . write for full data and samples. John A. Roebling's Sons Company, Trenton 2, New Jersey.

ROEBLING A CENTURY OF CONFIDENCE

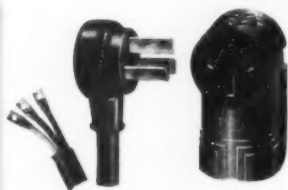
Atlanta, 934 Avon Ave. • Boston, 51 Sleeper St. • Chicago, 5525 W. Roosevelt Road
• Cincinnati, 3253 Fredonia Ave. • Cleveland, 701 St. Clair Ave., N. E. • Denver, 4001
Jackson St. • Houston, 6216 Navigation Blvd. • Los Angeles, 216 S. Alameda St. •
New York, 19 Rector St. • Philadelphia, 12 S. Twelfth St. • Portland, 1932 N. W.
14th Ave. • San Francisco, 1740 Seventeenth St. • Seattle, 900 First Ave. S.



ITEMS THAT
MARK THE
QUALITY JOB



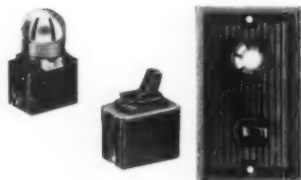
DUPLEX RECEPTACLE: One of these double-duty outlets should be located on every 3 feet of usable wall space, or so that no point of a room is more than 6 feet from an outlet.



SURFACE RANGE OUTLET, adds to convenience and utility of kitchen. Also available in flush type. All rubber Cord Sets for handy connections.



DOOR SWITCH light is on when door is open. Gives automatic lighting in dark closets.



INTERCHANGEABLE LINE affords numerous and attractive 1-gang combinations. Easy to wire. Plates, outlets, switches, pilot lights and other units available.

**BIG
BUILD
CONVENIENCE
INTO YOUR SMALLEST HOUSES**



**PROMOTE ADEQUATE WIRING
WITH H & H WIRING DEVICES**

When you're building in the budget class you can't take mansion-minded liberties — except when you get to the electrical system. Today, anybody who can afford to build a house can afford the maximum in electrical convenience — and that means adequate wiring, and a varied assortment of quality wiring devices. The cost is insignificant when compared to the benefits. Nowadays luxuries aren't luxuries for very long — they soon move into the necessities class. So don't short-circuit your customer's future. Sell him on the importance of a maximum job electrically. It's good business.

And for the wiring devices, choose from our complete and varied line of quality, dependable, modern units. There's no finer source. Catalog on request.

Through messages like these, we're reminding architects of the importance of adequate wiring, and quality wiring devices, to everyone in the building field. Good Housekeeping Building Forum booklet "Electrical Planning in the Home" sent on request.

Branches in: Boston, Chicago, Dallas, Denver, Detroit, Los Angeles, New York, Philadelphia, San Francisco, Syracuse.

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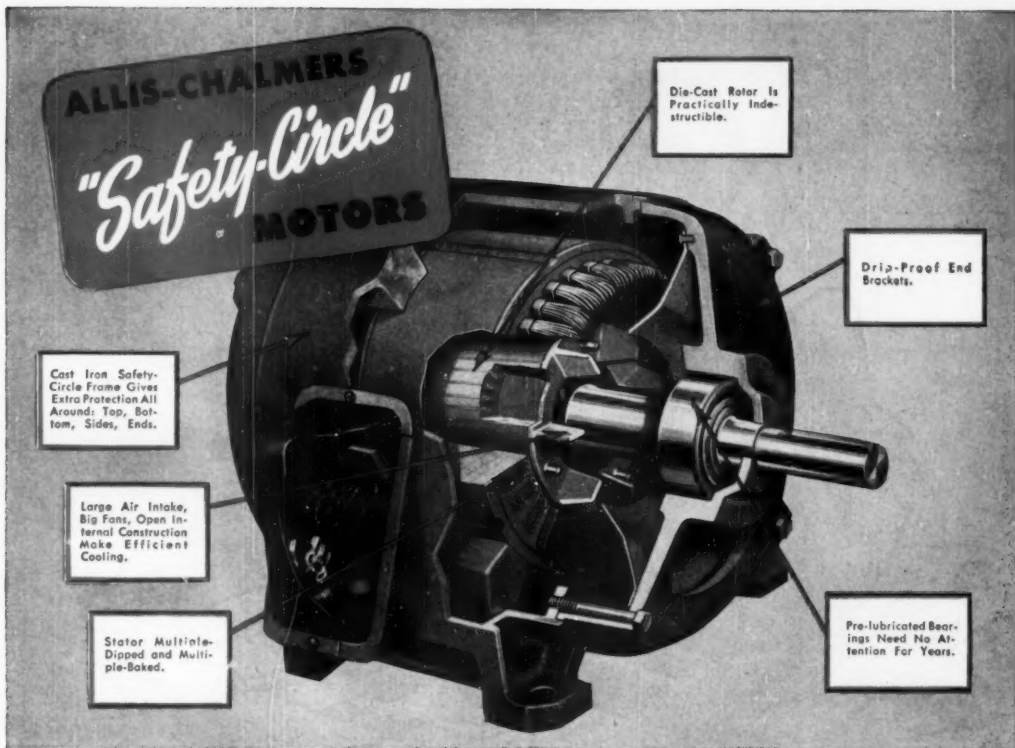
For more information, write today to:
1712 Laurel Street,
Hartford 6, Conn.

**WIRING
DEVICES**

**HART
&
HEGEMAN
DIVISION**

**ENCLOSED
SWITCHES**

**THE ARROW-HART & HEGEMAN ELECTRIC COMPANY
HARTFORD, CONNECTICUT**



HOW SAFETY-CIRCLE

Means Motor Dependability

EXTRA PROTECTION means extra dependability. That's why Allis-Chalmers protects the working parts of the motor with the exclusive **SAFETY-CIRCLE**. Compare this motor with motors of less rigid construction. The **SAFETY-CIRCLE** motor will not distort in mounting or under strain. And you get the extra protection of drip-proof end brackets at no premium.

EXTRA PROTECTION INSIDE, TOO
Stator is multiple-dipped and multiple-baked in special insulating varnish. Rotor is die-cast aluminum. Stator is mounted in four longitudinal ribs which leaves

plenty of air space between stator and frame. Large fans cast integrally with the rotor and ample air intakes keep temperatures well within rated limits. Ball bearings are factory-lubricated and require no further attention for years.

When you shop for motors, remember **SAFETY-CIRCLE** gives you extra protection, extra dependability and lower operating costs.

For details on **SAFETY-CIRCLE** advantages, see your A-C Authorized Dealer or Sales Office or write for Bulletin 51B6210B. Sizes 1 to 20 hp, 326 frames and smaller. *Safety-Circle*, *Texrope* and *Vari-Pitch* are Allis-Chalmers trademarks. A-3146

ALLIS-CHALMERS, 930A SO. 70 ST.
MILWAUKEE, WIS.

ALLIS-CHALMERS



Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Dealers,
Certified Service Shops and Sales Offices
throughout the country.



CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE — Belts in all sizes and sections, standard and Vari-Pitch sheaves, speed changers.



PUMPS — Integral motor and coupled types from $\frac{1}{4}$ in. to 72 in. discharge and up.

YOU CAN BE **SURE**.. IF IT'S
Westinghouse



Don't be a **FIXTURE PICKER!**

This "character" looks worried. He's picking lighting fixtures. But he won't find the answer in a magazine cutout.

What's more, there is no single "cure-all" lighting fixture. You know that, of course, but how many others do? Each luminaire has a different purpose—a different application—and a different economy depending on specific conditions.

Analyzing these conditions takes an expert. You need the services of a lighting engineer.

Whether you plan lighting, buy lighting, or install lighting, the services of a Westinghouse Lighting Engineer are available to you. J-04281

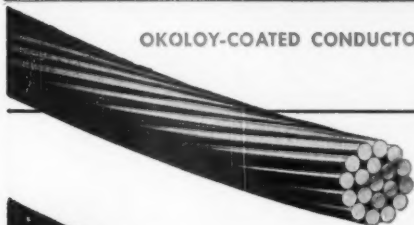


Westinghouse
PLANNED
LIGHTING
PAYS

4 reasons why

OKOLITE-OKOPRENE CABLES EXTEND CIRCUIT LIFE

OKOLOY-COATED CONDUCTORS



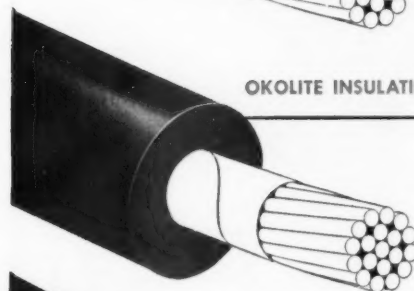
Okoloy coating on conductors—the special corrosion-resistant lead alloy that outlasts tinning 2 to 1.

SEMICON TAPE



Semicon tape over conductors—used in all Okolite-Okoprene cables operating at over 2,000 volts—eliminates internal corona cutting and increases dielectric strength.

OKOLITE INSULATION



Okolite insulation—moisture-resisting, high-voltage Okolite is made with Up-River Fine Para Rubber, the best grade of natural rubber. This oil-base insulation has been proved in years of service and is approved by Underwriters' Laboratories, Inc. as Type RW.

OKOPRENE SHEATH



Okoprene sheath—the pioneer neoprene cable covering developed in the Okonite laboratories. Its life-extending durability and stable characteristics have been demonstrated on millions of feet of cable installations. Okolite-Okoprene cable is approved by Underwriters' Laboratories, Inc., as Type RWSN.

Besides these four basic features, Okolite-Okoprene cables possess many other advantages in installation, operation, design and manufacture. For complete information on characteristics and applications, write for Bulletin EC-1037 The Okonite Company, Passaic, N. J.

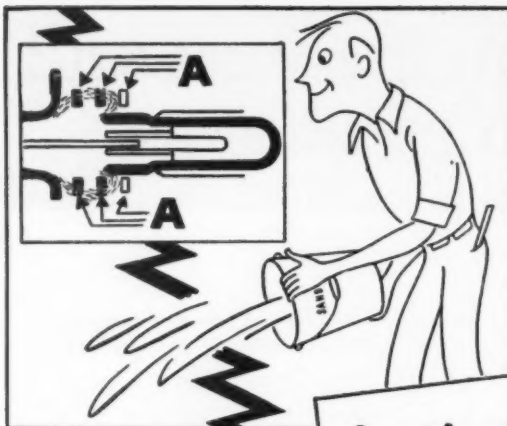
THE BEST CABLE IS YOUR BEST POLICY



OKONITE



insulated wires and cables



First Time in a Safety Switch!

Trumbull's HCl Type A Safety Switch uses magnetic repulsion to break heavy loads quickly, safely. Arcs repel each other... break against grid pins (A)... quickly cool. No pitting means longer contact life.

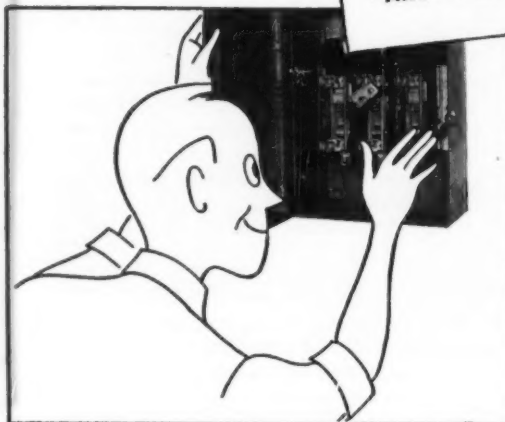


It's Easy to Install

Front fusing permits small box, yet leaves ample room for wiring. Front operation permits close ganging. Interior removable for wiring ease. No exposed live parts when switch is OFF and door is open.

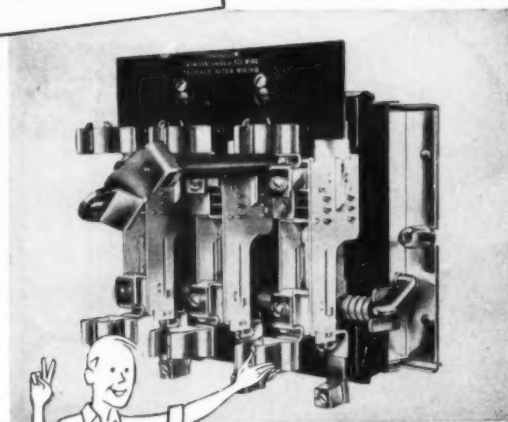
Give Your Customers Safe Load Breaking

WITH TRUMBULL'S UNIQUE
"ARC-QUENCHING ACTION"



No Dead Center

Roller-cam action—multiplying linkage design with powerful spring—throws switch to full OFF and ON. HCl withstands heavy short circuits without damage. 30, 60, 100 ampere sizes. Request Bulletin TEC-10.



Unit Package

Interior is easily removed for wiring or inspection. Includes handle as an integral part. Available as packaged unit, to be used in combination with other equipment.

TRUMBULL ELECTRIC

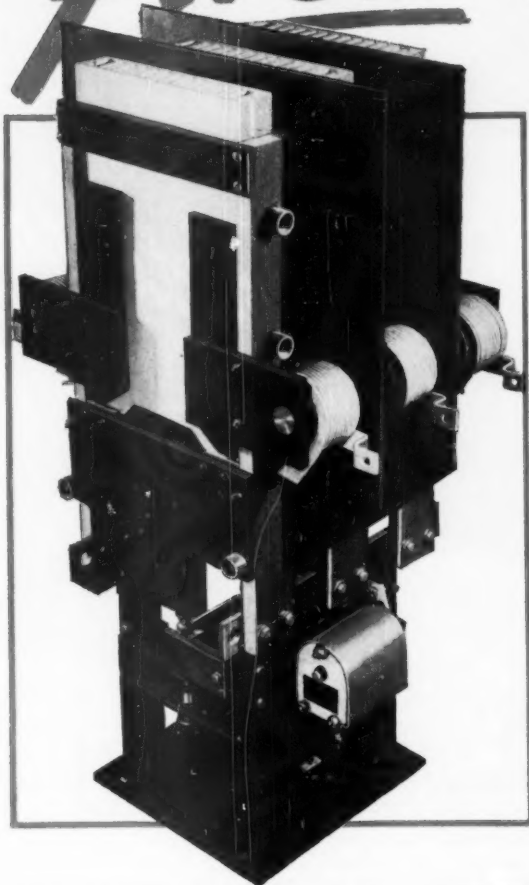
THE TRUMBULL ELECTRIC
MANUFACTURING COMPANY
Plainville, Conn.



TRUMBULL'S TRAIN OF NEW PRODUCTS

First

50,000 KVA AIR CONTACTOR



Maximum Rating of New Contactor

400 Amperes	50,000 kva
60 kv impulse	19 kv @ 60 ~ for one min.
1500 hp @ 2500 V.	2500 hp @ 5000 V.
25,000 amperes through current for 30 ~.	

THE ALLIS-CHALMERS Type 256 Air Contactor series has been expanded to include a 400 ampere, 5000 volt contactor. It's the *first* air contactor with this high rating! The *first* air contactor to control 5000 volt motors to 2500 hp . . . 3000 hp at unity power factor!

This new contactor is designed to fit your control system into your distribution system in any one of these three ways:

1. In conjunction with back-up breakers rated up to 25,000 amperes interrupting capacity; 150,000 kva at 4600 volts, 100,000 kva at 2300 volts,
2. With non-current limiting power fuses rated 250,000 kva and permitting instantaneous peaks to 54,000 amperes for one cycle.
3. Without back-up protection, on systems where faults cannot exceed 50,000 kva.

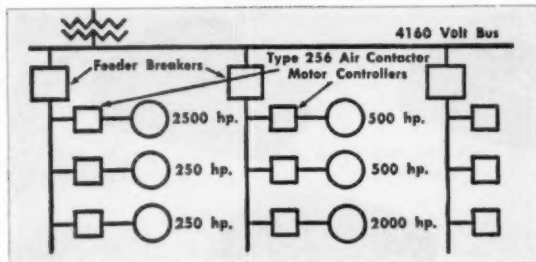
This 400 ampere air contactor will withstand short circuits up to 150,000 kva for 30 cycles. It provides a wide margin of safety when used with back-up circuit breakers with interrupting time of eight cycles.

Now, for the first time, this contactor provides both low initial cost and low maintenance cost for control of motors above 1000 hp at 2300 volts . . . above 1,300 amperes initial starting current. And it's recommended for continuous service on severe duty cycles!

For a contactor, a single starter, or an entire control group . . . to control squirrel-cage, wound rotor or synchronous motors . . . check with Allis-Chalmers. Call your nearby A-C representative or send for bulletins 14B6410 and 14B7303.

ALLIS-CHALMERS, 930A SO. 70 ST.
MILWAUKEE, WIS.

A-3201



This new contactor, with its 25,000 ampere through current rating, permits cascading motor starter with a back-up breaker to protect a group of motors on systems up to 150,000 kva, 5000 volts.

ALLIS-CHALMERS



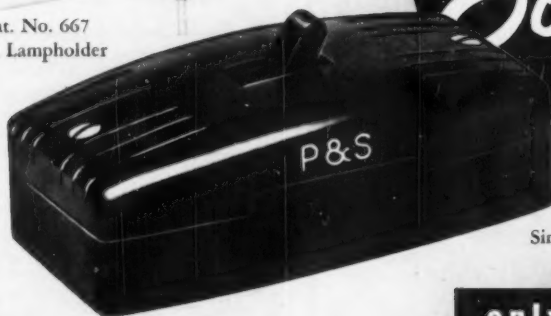


SURFEX
TRADE MARK

Something



Cat. No. 667
Pull Lampholder



Cat. No. 8661
Single Pole Feed-Thru Switch

**only 3 simple
things to do**

1. Mount the Device
2. Run the Wire
3. Connect the Terminals

new **all-plastic
devices make a great line,
the COMPLETE line**

Bases made of arc-resisting urea compound



Cat. No. 8666
Keyless Lampholder



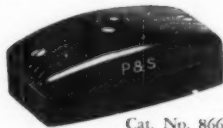
Cat. No. 8668
Rosette



Cat. No. 8667
Pull Lampholder



Cat. No. 8670
Duplex Convenience Outlet



Cat. No. 8669
Junction Box

FOR SURFACE WIRING

New has been added

**now P & S
offers new all plastic
devices in the SURFEX line . . .
in addition to the
porcelain-base devices**

NOW, P&S, the pioneers of surface wiring devices, give you a *Complete Surface Wiring Line* — including both ALL-PLASTIC devices and PORCELAIN-BASE devices.

For Use with Non-Metallic Sheathed Cable

The new, lighter, ALL-PLASTIC Surfex devices are designed for general purpose surface wiring in locations where there is no excessive moisture or dust. All current carrying parts are mounted on urea plastic bases having high resistance to arcing and tracking.

The Original PORCELAIN-BASE Surfex devices are designed for all surface wiring and are especially suited to locations where excessively humid and extremely dusty conditions are encountered. In these devices all current carrying parts are mounted on porcelain — the perfect insulator, which will not support arcing or tracking.

Whether you prefer the new, ALL-PLASTIC, or the original PORCELAIN-BASE devices — you can be sure of the same easy-to-wire features — the same precision-built, long lasting quality. All switches are T-rated. All outlets have double grip contacts. All P&S Surfex devices have buss bars for third wire or feed-thru connections — large wiring chambers for cross-overs — knockouts for No. 12 or No. 14 standard non-metallic sheathed cable, 2 or 3 wire — also smaller knockouts for knob and tube wiring — easy wiring terminals, no wire loops or splicing necessary — large No. 8 screws for easy mounting. All devices meet or exceed R.E.A. and Government Specifications.

For catalog information on THE COMPLETE P&S SURFEX LINE, mail the coupon today.



PASS & SEYMOUR, Inc., 34 Boyd Ave., SYRACUSE 9, NEW YORK

IT'S P & S SURFEX

**the original
porcelain-base
SURFEX line**



Cat. No. 666
Keyless Lampholder



Cat. No. 668
Receptacle



Cat. No. 661
Single Pole Feed-Thru Switch



Cat. No. 678
Duplex Convenience Outlet



Cat. No. 669
Junction Box

Yes: I'd like more information on the complete P&S Surfex line. Send it right away to:

Name _____

Address _____

City _____ Zone _____ State _____

simple...



THE REVOLUTIONARY NEW O.Z. KWI-COVER

it's tops for
fast, easy installation...



BETTER PROTECTION

Here's the simplest, fastest-to-install cover you ever saw or used. This two-piece, molded canvas-bakelite cover entirely eliminates tedious taping. You simply put the KWI-COVER over the tap,—snap the fasteners — and that's all there is to it. The four sturdy stainless steel spring fasteners center automatically; lock out dirt and prevent damage. Loose parts have been eliminated. Snaps are an integral part of the cover body — can't get lost, can't fall off. And sturdy! KWI-COVER is super-strong, has high impact strength — can really stand up under abuse.

O. Z. KWI-COVERS for tee, parallel or two way taps are available from stock. Write today for detailed information on the simplest, strongest tap cover of them all.



Type
XTPC



Type
XWC



Type
PTC




Type
PMC



And Remember — They're O. K. If They're O. Z.

CONDUIT FITTINGS • CABLE TERMINATORS • CAST IRON BOXES • GROUNDING DEVICES • SOLDERLESS CONNECTORS • POWER CONNECTORS

YOU CAN BE SURE... IF IT'S
Westinghouse



Yes, you can quote me!

"AB-I Breakers save me over \$1000 a year"

"Before installation of your AB-I Circuit Breakers, we had a power failure once or twice a year on our induction heaters. Each failure cost between \$1,000 and \$1,500 in loss of material in process, and lost time pay. Since the installation of AB-I Breakers we have had no interruption of power. They've more than paid for themselves."

So states the plant engineer of Raytheon Manufacturing Company, Receiving Tube Division, of Newton, Massachusetts. Naturally, he is an enthusiastic supporter of AB-I Breakers. Five breakers, at a net cost of \$166 have enabled Raytheon to make substantial yearly savings.

Unusual? No, typical of the savings possible when you replace ordinary protective devices with Westinghouse AB-I Breakers. That is because they protect insulated conductors from

overcurrent and short circuits—without fuses. They allow momentary overloads, yet trip instantly when a dangerous overload occurs. After the fault is cleared, the workman can restore service immediately without danger or exposure to live parts. Westinghouse AB-I Breakers offer special features not obtainable in similar devices, in a broad range of sizes and types. Get the facts. See your nearby Westinghouse representative, or write for Bulletin DB-30-230. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-30027

Westinghouse
AB-I BREAKERS



Side Step POWER LOSSES

ALLIS-CHALMERS
Dry-Type
TRANSFORMERS

WHEN YOU SPECIFY Allis-Chalmers dry-type transformers you specify higher efficiency, more production and safe, economical utilization of power.

GET THESE BENEFITS

1. Top performance for equipment. Higher starting torque for motors, brighter lighting, quicker heating. You eliminate waste power by installing dry-type transformers near or on the machine it serves.
2. Flexibility in matching changing loads. Shift the dry-type transformer when new machinery is added or when distribution lines are unbalanced and subject to overloads.

IMMEDIATELY AVAILABLE

Quick delivery from dealers coast to coast. No need for costly fire proof vaults. The dry-type transformer meets safety requirements for indoor applications.

Men who work with plant layout have discovered how Allis-Chalmers dry-type transformers overcome heavy secondary losses and poor voltage regulation.

QUICK TO INSTALL, LONG ON SERVICE

SOLDERLESS CLAMP CONNECTORS reduce hook-up time to minutes. Just clamp leads to solderless

connectors. Standard on units 15 thru 50 kva (single phase) and 37½ thru 100 kva (three phase). On larger sizes flat drilled bars are suitable for any connector. 10 kva and smaller (single phase) and 25 kva and smaller (three phase) front and bottom plates drop out.

HEAT RESISTING "FIBERGLAS" insulation cuts down transformer size and weight and gives added protection against fire hazard. All welded case and sturdy side frames retain alignment of the core and coils. *Spra-Bonderized* and given 3 coats of baked-on durable paint.

For more information see your local Allis-Chalmers sales office. Or write direct for bulletin 61B6382A.

ALLIS-CHALMERS, 930A SO. 70 ST.
MILWAUKEE, WIS.

A-3200

ALLIS-CHALMERS



CRESCENT ENDURITE

DUAL PURPOSE WIRE & CABLE

Listed by Underwriters' Laboratories as

TYPE RH-75°C

OR

TYPE RW-60°C



In DRY locations ENDURITE insulated wire and cable with its superior heat-resisting characteristics, is rated as a Type RH with higher permissible operating temperature and consequently greater carrying capacity.

In WET locations this same wire with its excellent moisture-resisting qualities is rated as a Type RW.

Except where voltage drop is the determining factor, CRESCENT ENDURITE when used as a Type RH allows the use of a smaller size of cable and in many cases smaller size of conduit at less cost than would be required for Type R or Types T or TW for the same load.

Usually in sizes No. 6 A.W.G. and heavier for power circuits and No. 1 A.W.G. and heavier for lighting circuits CRESCENT ENDURITE as TYPE RH will give the lowest cost per ampere of useful circuit capacity.

For branch circuits requiring small size conductors, Voltage Drop is the determining factor in the choice of conductor size.

There is also a definite advantage to you in the REDUCTION OF STOCKS as this one wire will meet all your building wire requirements for both the usual dry location and the occasional wet location.

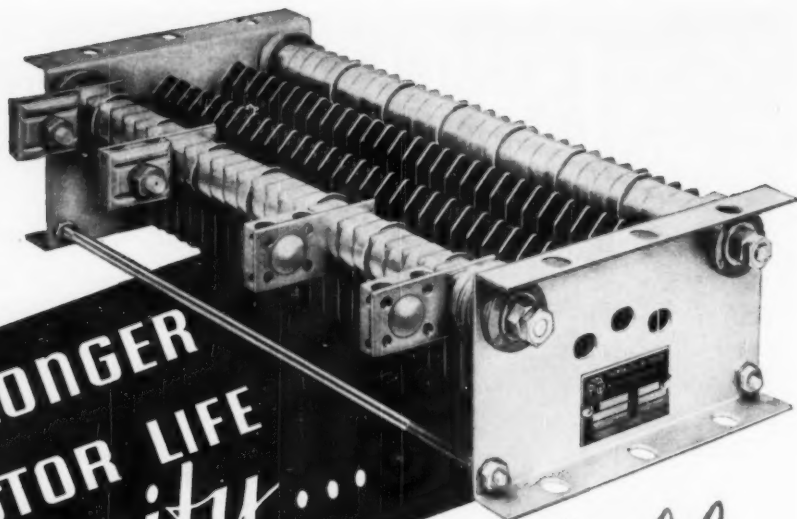
Send for Bulletin giving Comparative Current-Carrying Information



CRESCENT INSULATED WIRE & CABLE CO.

Trenton, New Jersey, U. S. A.





**FOR LONGER
RESISTOR LIFE**

Specify...

Nonbreakable

P-G STEEL GRID RESISTORS

Longer resistor life as afforded by P-G is the result of exclusive features of design coupled with use of the most durable raw materials.

Grid plates are shaped for maximum ventilation and heat dissipation with tests showing unusually even temperatures over the entire working surface. Thus, "hot spots" one source of resistor trouble, are eliminated.

Unique methods used to mount grid plates in their supporting assemblies is equally important to long resistor life. P-G "floating bolt" construction allows the resistor to expand as operating temperature builds up. Thus damage from expansion, another source of resistor trouble, is minimized.

These and similar practical features of design, plus Steel and Mica as basic materials make P-G the answer for longer resistor life. Ask for Bulletin No. 500E for more detailed information.



The Nonbreakable Steel Grid Resistor

THE POST-GLOVER ELECTRIC COMPANY

• ESTABLISHED 1892 •

221 WEST THIRD STREET, CINCINNATI 2, OHIO

Who are You?



Contractor?



Architect?



Dealer?



Wholesaler?

Whatever your particular interest in steel switch and outlet boxes, you know the *Quality* that makes Racó products unfailingly dependable, the *Completeness* of the Racó line for all commercial and home wiring jobs. Add to these the *Approval* by Underwriters' Laboratories, Inc. and you have all the assurance you need that Racó is right. All of this is the result of policy—a disciplined resolve to make Racó products the top line in the market.

You can always rely on RACÓ

RACÓ

ALL-STEEL PRODUCTS

ALL-STEEL EQUIPMENT Inc.—800 Kensington Ave., Aurora, Illinois

"A BOX FOR EVERY NEED"



REG. U.S. PAT. OFFICE

lights them **ALL!**

From coast to coast and border to border, MITCHELL MODULE is lighting America's stores, offices and institutions.

MODULE has conclusively demonstrated its amazing adaptability to *all* commercial lighting demands—has proved its ability to provide smooth, custom-fitting, high-efficiency lighting at unprecedented low cost.

See the proof now—in actual photographs. Get your copy of MODULE IN ACTION—the new booklet that illustrates a cross-section of actual MODULE installations, representative of hundreds now in service—telling *proof* of extraordinary lighting superiority and flexibility. Here are ideas galore for contractors, architects, utility representatives—a clinching demonstration for lighting salesmen. See how MODULE *lights them ALL*—send today for your free copy of MODULE IN ACTION.

MITCHELL MANUFACTURING COMPANY

2525 N. CLYBOURN AVENUE • CHICAGO 14, ILLINOIS

In Canada: Mitchell Mfg. Co., Ltd., 11-25 Lavies Ave., Toronto

MITCHELL MANUFACTURING COMPANY
2525 N. Clybourn Ave., Chicago 14, Illinois

Send free MODULE IN ACTION brochure.

Firm Name _____

Address _____

City _____ Zone _____ State _____

Attention _____

at least

BUILDING WIRE THAT LASTS LONGER, PULLS EASIER, SAVES MONEY

...Thanks to TRIANGLE'S GLAZON

For EXTRA value—at NO extra cost—Insist on
"GLAZON"

What "GLAZON" is:

"Glazon" is a tougher, more flexible, longer-lasting braid that combines the desirable properties of an inorganic substance derived from glass with those of special saturants to achieve a new high in safety and durability under the most adverse conditions. This new protective covering gives:

LONGER LIFE. Conductors and insulation are doubly protected by a stronger, tougher, more impervious and more durable covering than heretofore possible.

SMALLER DIAMETER. Braid, although stronger, is considerably thinner. Strands lie flatter, clasp insulation tighter, absorb less saturant—reducing diameter.

GREATER FLEXIBILITY. Less bulk and greater elasticity of the braid increase flexibility.

SMOOTHER SURFACE. Uniformity of fiber and tighter lays eliminate the uneven surface common to many braided coverings.

GREATER RESISTANCE to the destructive elements of man and nature: water, heat, oil, acid, corrosive fumes, fungus, rodents, sunlight, freezing, rotting.

IMPROVED FISHABILITY. "Glazon" covered wire can be snaked through longer conduits, around sharper bends, easier, quicker, than any other type.

▲ **EVEN SURFACE,** free from bumps and ridges, slides easier.
▲ **SMALLER DIAMETER** saves space, makes it twice as easy to snake in "that last one."
▲ **SMOOTH FINISH** prevents sticking, reduces friction on long runs and around sharp bends.
▲ **TOUGH COVERING** resists impact and abrasion.
▲ **GREATER FLEXIBILITY** saves time in wiring every junction box, switch box, outlet box.
Costs No More—Yet Saves At Every Step of the Wiring Job
Available in sizes from No. 14 through No. 6 AWG with solid or stranded conductor.
Types B, BH, BW.

If It's "GLAZON" It's Made by TRIANGLE . . .
If It's Made by TRIANGLE It MUST Be Right!

TRIANGLE CONDUIT & CABLE CO., INC.

1908 JERSEY AVENUE • NEW BRUNSWICK, NEW JERSEY



"GLAZON" BUILDING WIRE • BARE WIRE • ARMORED CABLE • "GLAZON" NON-METALLIC SHEATHED CABLE • SERVICE ENTRANCE, SERVICE DROP, VARNISHED CAMBRIC BRAIDED OR LEADED, TRIOPRENE TRENCH, POWER AND PARKWAY CABLES • RIGID CONDUIT HOT-DIPPED GALVANIZED • ELECTRIC METALLIC THIN WALL CONDUIT • FLEXIBLE STEEL CONDUIT

for safety's sake...



Equip your cranes with Wagner "Full Control" Hydraulic Bridge Brakes

Hydraulic brakes have proved to be the best brakes available to bring overhead traveling cranes to safe, sure stops. Hydraulic brakes for the bridge drives of electric overhead traveling cranes are included in AISE Specifications. Play safe . . . equip your cranes with Wagner Hydraulic Crane Bridge Brakes and give your operators "full control" at all times for close spotting and smooth deceleration.

* * *

Only WAGNER Hydraulic Crane Bridge Brakes give you all these features:

A Size and Type for Every Application . . .

Two types, with or without parking attachment, and four sizes are

capable of handling any application.

Remote Control Bleeder . . .

Keeps lines full of fluid, maintains peak braking efficiency, and makes bleeding the system an easy, "one-man" job.

Self-Centering Device . . .

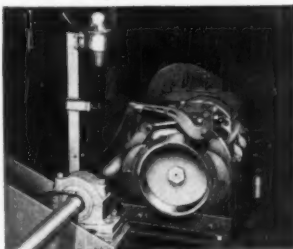
Prevent brake shoe drag by assuring equal clearance of both brake shoes.

Other Advantages Include . . .

Power failure braking . . . one-point shoe adjustment . . . 200% emergency torque . . . grease fittings for lubrication . . . non-scoring, easily replaceable molded lining blocks.

If your cranes are not equipped with Wagner brakes, one of our

field engineers will gladly show you how simple it is to install a modern hydraulic system. If you now have Wagner brakes, your system can be quickly modernized with our complete conversion kits . . . Bulletin IU-40 gives full information—write for copy.



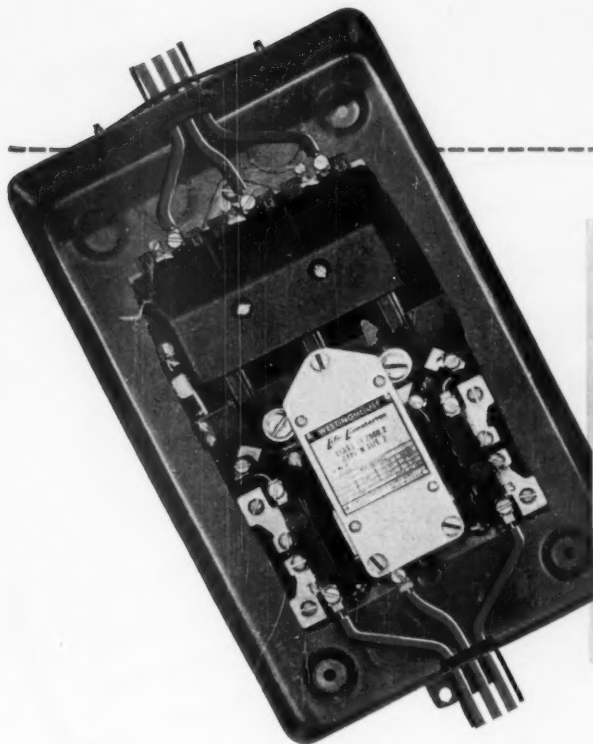
Wagner
Electric Corporation

EST. 1891

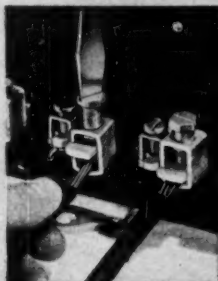
WAGNER ELECTRIC CORPORATION
6413 Plymouth Ave., St. Louis 14, Mo., U.S.A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS — AIR AND HYDRAULIC

BRANCHES IN 31 PRINCIPAL CITIES



YOU CAN BE **SURE**.. IF IT'S
Westinghouse



➡ **PRESSURE-TYPE CONNECTORS**

➡ **STRAIGHT-THROUGH WIRING**

NEW* Life-Linestarter

cuts installation costs 4 ways!

Savings start before they are put in operation... with the new Westinghouse Life-Linestarter. New design features permit faster, easier installation—

1. **Straight-through Wiring**—Plainly marked line terminals are *all* at top—load terminals *all* at bottom, permitting simple, straight-through wiring with uniform lead lengths. All terminals are easily reached from the front.
2. **Pressure-type Connectors** speed the job and provide a positive low-resistance connection for either solid or stranded conductor, in a range of sizes to cover all ratings.
3. **NEMA Standard Mounting**—Open starter units conform to the new NEMA mounting dimensions, also to the NEMA sequence of wiring, permitting interchangeability.
4. **Deep-drawn Lift-off Cover**—Exposes unit for easy access. Fastens securely. May be padlocked. No hinge trouble.

The Life-Linestarter cuts costs in other ways, too—uniformity and completeness of line (NEMA sizes 0

*Trade Mark

through 4, to 100 hp, 600 volts)... superior performance... positive protection. Ask your Westinghouse representative to show you "the inside story"—a Trans-Vision presentation. Or write for booklet B-4677. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna.

J-30025



TOMORROW'S STARTER—TODAY!



Invest in the Best—choose SANGAMO

When your customers want a *dependable* lighting installation—and they all do—you will find it good business to invest in the best when it comes to choosing the time switch to provide automatic control. You avoid profit-eating service calls due to faulty time switch operation. Your customers are satisfied with the installation, and you add to your reputation for top quality workmanship.

While Sangamo Time Switches are slightly higher priced—users enjoy year after year of troublefree automatic control. Sangamo Heavy-Duty Time Switches are built to exacting standards of quality—they never were designed to compete in price.

For example, the Type L is a versatile unit, capable of continuous service under widely vary-

ing control requirements. It performs dependably, even in sub-zero weather—without the need of special coils or other low temperature protective devices... it can be supplied with an omitting device—an advanced time cut-off—or an astronomic dial for automatic sunset to sunrise operation. The Type W offers all these features, plus a complete electrically-wound mainspring and timing mechanism that takes over immediately in case of a power failure and does not have to be reset after current interruptions. These two types, and all other switches in Sangamo's complete line are available through your electrical wholesaler.

Sangamo's 16 page Time Switch Catalog No. 1010A tells everything you should know to help you choose the best possible time switch for your next installation. Write for your copy today.



The Slightly Higher Price is Soon Forgotten—But the Quality Remains

SANGAMO
ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

ET30-15

Have You Tried the
SANGAMO Type S?
Here's precision in miniature! An economical, compact, unusually attractive time switch for simple time control problems.





TRI CLAD

REG. U.S. PAT. OFF.

MOTORS

will run safely without relubrication for as long as any general-purpose motor you can buy—

and if the application makes relubrication a must, you can grease a **TRI CLAD** without halting production

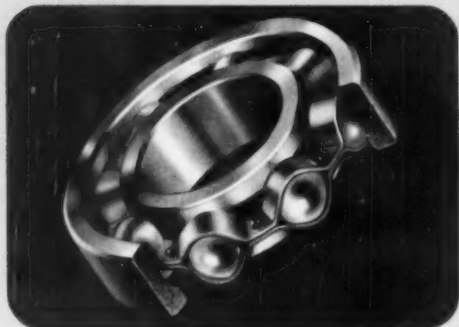
GENERAL



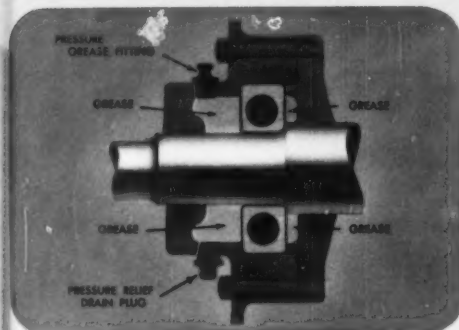
ELECTRIC

**HERE'S
WHY**

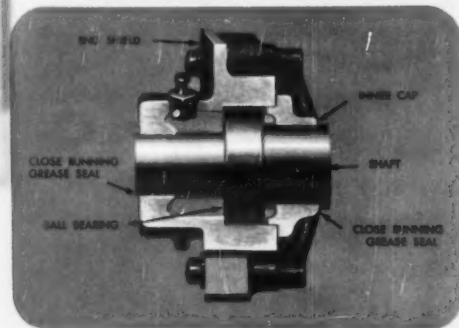
TRI-CLAD MOTORS will run safely without relubrication for as long as any general-purpose motor you can buy—



- 1 EXTRA BEARING PROTECTION** — Tri-Clad gives you extra bearing protection because heaviest standard-service bearings are carefully selected to withstand severe loads for long periods.



- 2 EXTRA GREASE** — Four times the ordinary amount of grease is packed into the large Tri-Clad grease reservoir. Since bearing life depends on grease, this means that Tri-Clad motors will run safely for years—for as long as any general-purpose motor you can buy.



- 3 SEALED-IN BEARINGS** — Bearings and grease are completely sealed in a cast housing with long running seals for extra protection from dirt, dust, and lubricant leakage.

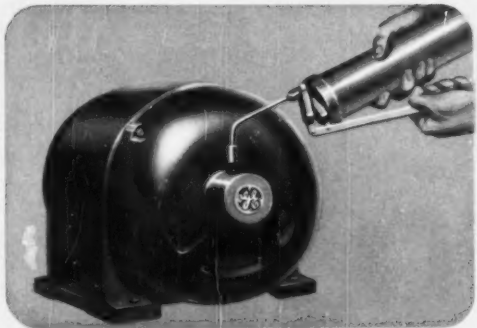
Tri-Clad extra lubrication "protection" can save you money because:

1. Tri-Clad's oversize grease reservoir and the heaviest standard-service bearings mean you do not have to bother with greasing between motor check-ups.

2. When relubrication is needed on those tough applications, you can grease a Tri-Clad without interrupting production-line operations.

Tri-Clads are grease-gun easy to lubricate *on the job*. Moreover, a Tri-Clad motor will run safely where an ordinary motor would fail. Chances are you'll be spared the cost of a "special" motor.

YOU BE THE JUDGE! The best way to prove to yourself that Tri-Clad gives you the most for your motor dollar is to contact your local G-E office. Tri-Clad stocks are complete. Apparatus Dept., General Electric Company, Schenectady 5, N. Y.



- 4 PRESSURE-RELIEF GREASING** — An efficient system of pressure-relief lubrication (with standard fittings) enables a Tri-Clad motor to be quickly and easily greased on the job when and if it's needed.

GENERAL ELECTRIC



DECEMBER . . . at a Glance

Outstanding Electrical Construction

Caterpillar's new diesel engine plant at Peoria, Illinois has been selected as an example of outstanding electrical construction for presentation in this issue. Provisions for service continuity and operating flexibility are among the highlights of the electrical design and, of particular importance in these times, the system evidences considerable thought toward economy of maintenance.

As in other major articles of this type, the editorial treatment breaks the project down into its major components; primary and secondary distribution, lighting and maintenance features.

Storm Damage

Along the Eastern seaboard, last month's big wind killed people and destroyed property. Most widespread effects were the breakdown of power lines with resulting inconvenience to thousands of families. The press took due notice of the helplessness of the "electrified home" when the elements turn rough. It wasn't good reading for folks who have a stake in the electrical industry.

People accept overhead distribution of electricity uncritically. They take

power failures due to wind and ice stoically. They assume that the defacing array of poles and open wires are essential engineering concomitants to their use of this kind of energy. Electrical men who know better maintain a discreet silence or mumble about the "prohibitive" costs of underground distribution.

With all due respect to the economics of distribution—open wire on poles is still considered the cheapest method—isn't it possible that the growing public dependence upon electrical energy deserves a better guarantee of uninterrupted service? Is the cost of modern underground cable installed with mechanical trenchers really "prohibitive"? Must we persist in strangling the golden goose of electrification with penny-wise "weatherproof" wires?

The only reason why the lights go out when the wind blows is because underground distribution, like adequate wiring, costs a little more than the minimum standard.

Controls

Mobilization controls, staffing of Washington bureaus and interpretation of control rules are moving at a fast pace. Keeping up with events that may have direct or indirect effects on the technical and management affairs of our readers requires

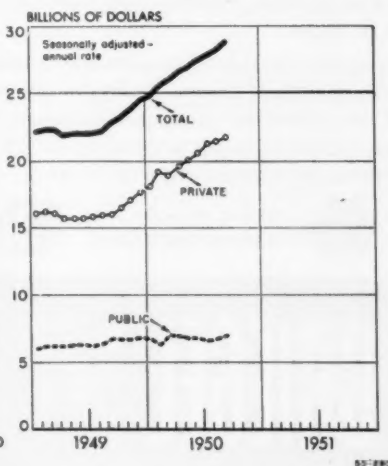
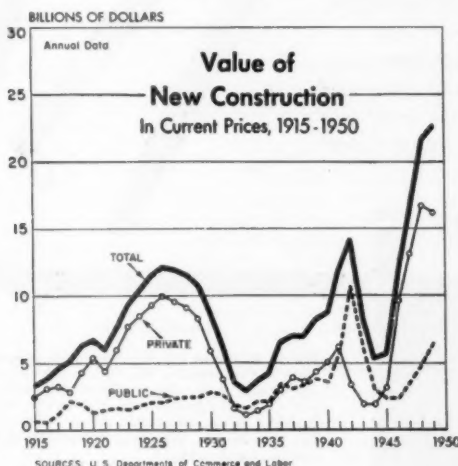
more than routine reporting. It takes a well grounded knowledge of electrical industry problems and practices plus keen insight into the ways of government bureaus. We strongly recommend the Washington Roundup on page 131 as "must" reading for these times. It is prepared by Eastern Editor B. C. Cooper, with the cooperation of our Washington office staff.

Estimating

The "How to Estimate Electrical Work" series skips this month, but will appear in double measure in January to make up. Many readers have asked us if the series will be made available in reprint. It will be reprinted as soon as the sections on labor units are complete.

Silicone Rewinds

Class H rewinds present not only technical shop problems concerned with methods and materials but business-wise there is a matter of getting substantially more money for the more expensive materials and the increased shop costs. William Henry of the Henry Electric Company of Saginaw, Michigan, discusses both angles in his revealing article, "Silicone Rewind Costs" on page 48.



You can't buy Better Fittings

or ones that
cost less
to use



Quicker to use and neater in appearance, Briegel All-Steel Indenter Fittings not only make stronger connections but also make each job more profitable to the contractor and satisfactory to his customers.

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Preventive Maintenance

SYSTEMATIC CARE, inspection and replacement of essential working parts of an electrical installation pays off. But it is not always easy to sell. The costs of preventive maintenance in materials and man-hours are considerable and they can be sharply defined.

RESULTS, HOWEVER, are in an area not so easily appraised. They are in production uninterrupted by electrical breakdown. They are in materials selected and installed under normal job conditions, not under urgent need. They are in labor hours expended efficiently under systematic routine, not under pressure of emergency.

HISTORICAL ANALYSIS, or the costs before and after the introduction of preventive maintenance programs can give strong support to the preventive method if adequate data are available. But they rarely are. The costs available are usually limited to actual repair and maintenance operations. A comparison of such net maintenance costs over a period under fix-it or breakdown and repair methods with the costs of a preventive maintenance program are of little value since they ignore the very essence of the maintenance operation.

LIGHTING SYSTEM MAINTENANCE is a good illustration. Under lamp replacement on burnout and cleaning incidental to replacement, the lamp cost is held to a minimum; the labor cost is relatively high. Under preventive schedules, lamp replacement occurs before burnout. Cleaning is systematic. Labor costs are reduced. If these were the only considerations, the cost difference would still favor preventive maintenance.

DESIGN OF LIGHTING SYSTEMS, however, is keyed to a lighting result. That is why the investment was made. If under poor maintenance the lighting result is allowed to depreciate, the values inherent in the design and in the investment are lost. It is an elementary responsibility of maintenance operations to keep the investment in lighting results at a practical optimum. The only practical method is a systematic maintenance schedule which is inherent in preventive maintenance.

UNINTERRUPTED PRODUCTION, maintenance of design lighting values, anticipation and prevention of outage, of hazards and of breakdowns are basic to the whole concept of modern maintenance operations. They are fundamentals, too, of the preventive maintenance plan.

THE ADVANTAGES of preventive programs are not always self evident. There is a lot of fussing with perfectly healthy equipment. Materials and apparatus are sometimes discarded while they still work. It takes considerable accounting knowledge and courage to remove and throw away lamps that appear to be burning brightly. So a sound preventive maintenance program involves a good deal of selling.

IN THESE TIMES, preventive maintenance is of even greater importance from the standpoint of insuring against unwanted shutdown. Emergency repairs are becoming harder to cope with because skilled men are not always on tap and needed materials are not promptly available. Industrial electrical maintenance departments and industrial electrical contractors who will sell and institute planned preventive maintenance schedules have a chance to make a vital contribution to the tremendous production job that lies ahead.

William T. Stuart



How to keep customers "POWERFULLY" HAPPY!

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CATERPILLAR'S new 20-acre diesel engine plant in Peoria is the first major milestone in the Company's expansion program.

CATERPILLAR ... of PEORIA

Service continuity, operating flexibility and maintenance economy are features of the electrical distribution system at Caterpillar's new Diesel Engine Plant in Peoria.

By Jesse G. Crowl

*Superintendent of Maintenance, Diesel Engine Plant
Caterpillar Tractor Co., Peoria, Illinois*

OUR and one-half years of careful planning went into the design of the new Diesel Engine Plant of the Caterpillar Tractor Co., Peoria, Illinois. Built and equipped expressly for the economic production of the Company's line of diesel engines, the 19.3 acre building houses all the necessary machine shop, assembly, test, parts storage, maintenance and personnel facilities.

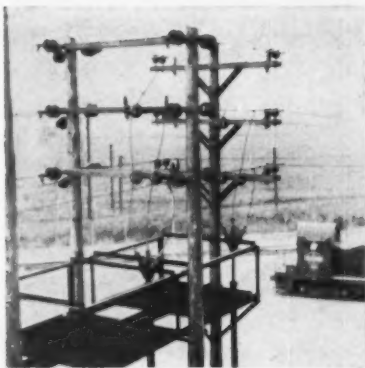
In the 10.6 acre machine shop area, 30 machining lines contain a total of 1,140 machines. The assembly area has 78 machines incorporated in its three lines for basic engines and two lines for the erection, testing, painting and shipping of industrial engines. A sound-proofed test room containing

21 test cells, each accommodating two engines, completes the assembly area.

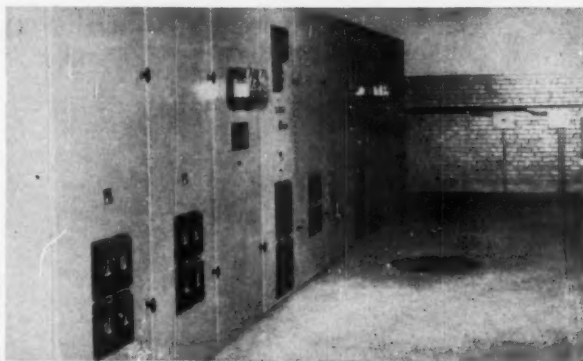
Close production scheduling and full utilization of production equipment is permitted by a modern integrated mechanized parts and materials handling system. Approximately 4,800 tons of materials per month are handled by four miles of conveyors and 1,400 hoists and cranes up to 15 ton capacity. Industrial trucks and an industrial railroad system complete the layout.

Backing this array of production equipment is an electrical distribution system carefully planned for service continuity, flexible operation, and maintenance economy. Caterpillar engineers collaborated in the electrical design with Giffels & Valet, Inc., architects and engineers of Detroit, Michigan. The complete electrical installation was made by Hatfield Electric Company of Indianapolis, Indiana.

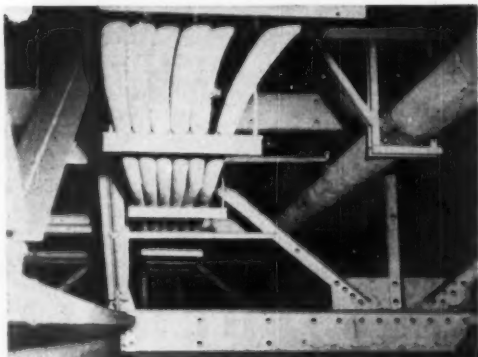
A "split-parallel" primary feeder system assures service continuity; a tailor-made bus duct and trolley duct secondary distribution provides operating flexibility. Electrical system color coding plus branch circuit numerical machine identification, initiated by Caterpillar engineers, leads to electrical maintenance economy. Installation highlights are covered in the following pages. **MORE** →



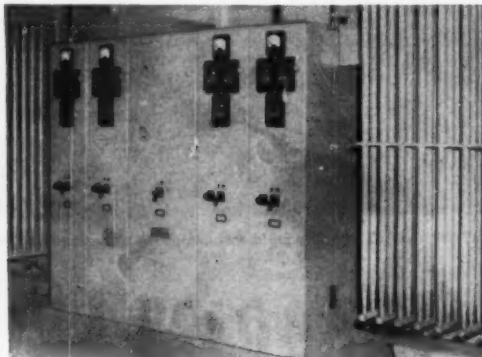
PRIMARY POLE STRUCTURE where 14.4-kv overhead circuits connect to potheads.



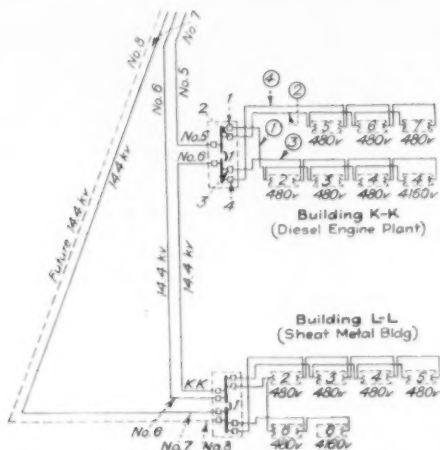
INCOMING SWITCH CUBICLES in the primary switch room of the plant. Cables at left are feeders to roof substations.



PRIMARY DISTRIBUTION FEEDERS are supported on trapeze hangers high in the roof trusses.



TWO 14.4-kv CIRCUITS serve the diesel engine plant. Dual feeders in "split-parallel" arrangement carry primary power.



4,160-VOLT SUBSTATION has two 2,000 kva, 14.4-kv/4,160-volt, 3-phase transformers. Cubicle has tie-breaker.

Primary Distribution

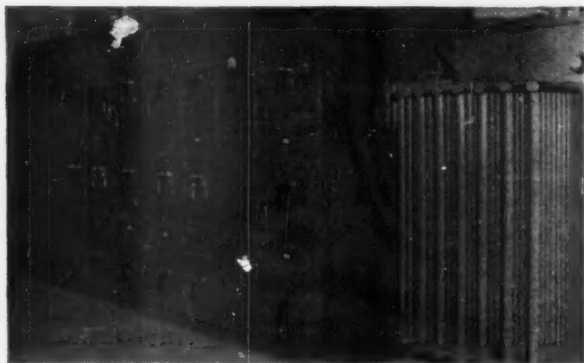
Two 14.4-kv overhead primary circuits serve the Diesel Engine Plant (Building KK). One circuit goes direct to an adjacent building (LL), then back to the engine plant. This second building is also served by a third primary line and has provisions for a fourth (future) circuit.

A bus-tie between the primary circuits in each building provides interconnections so any one of the circuits can feed either plant in an emergency.

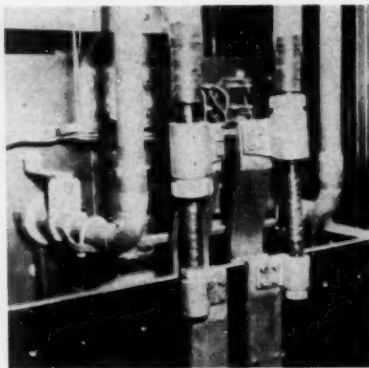
A "split-parallel" primary feeder system serves banks of roof substations in each building; assures service continuity under emergency conditions. The engine plant has seven substations. Six of them each have two 1,000-kva, 14,400/410-volt, 3-phase transformers. The other, for induction heat treat and compressors, has two 2,000 kva, 14,400/4,160-volt, 3-phase units.

Groups of substations are served by two sets of dual primary feeders; three substations on one, four on the other. One transformer of each substation is connected to one of the dual feeders; the second cable feeds the other transformer of each unit.

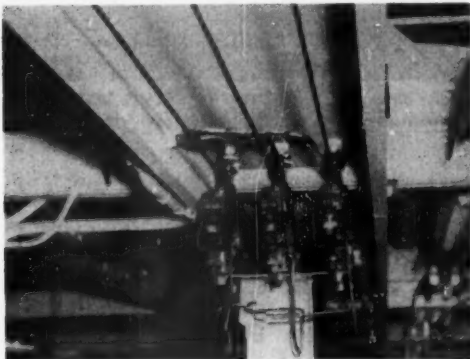
Each dual set of primary feeders is "split" at the primary



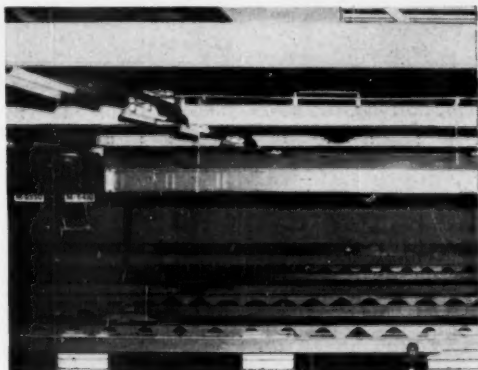
TYPICAL ROOF SUBSTATION with two 1,000-kva., 14.4-kv./440-volt, 3-phase transformers. Secondary cubicles feed bus duct system and fans.



CO-AXIAL CABLE CONNECTIONS to rapid-acting, air-blast contactors.



INVERTED METAL TROUGH protects open trolley wires on larger cranes; permits intermediate insulator suspension.



PLUG-IN BUS DUCT lines carry secondary power to machine locations; are suspended from truss chords.

cubicle so each cable is connected to a different primary service bus. In this manner, primary circuit No. 5 has two feeders (1) and (2) which serve the left hand transformer of each substation. Primary circuit No. 6 also has two feeders (3) and (4) which serve the other (right) transformer of each substation. Cables (2) and (4) from circuits No. 5 and No. 6 constitute the dual feeders to one group of substations; cables (1) and (3) form the other dual feeder to the second substation group.

This arrangement provides the desired service continuity in an emergency. If a primary circuit, or feeder cable, or both should fail, one transformer at each of the substations will still be in operation.

Feeder cables from the primary cubicle buses to the substations are carried on trapeze hangers between the roof and the truss chords.

Secondary Distribution

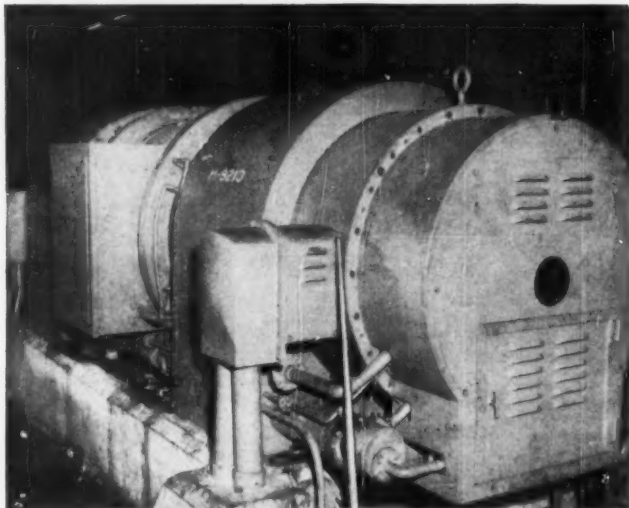
Tie-breakers on the secondary substation buses permit shift of essential loads from one transformer to the other in case a unit fails.

General 440-volt, 3-phase power distribution is accom-

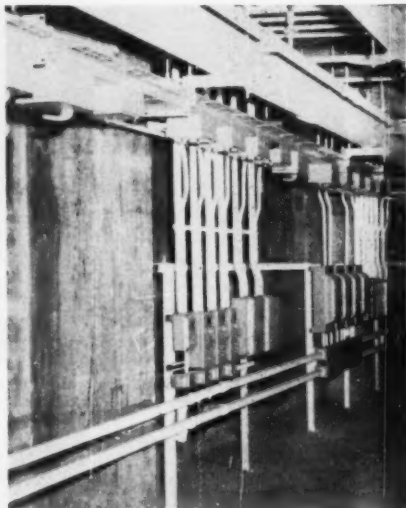
plished with bus duct runs. Branch circuits to individual machines are installed in conduit from the duct plugs, down the nearest column and in the wood block floor to the machine control. To reduce initial cost and overcome field installation problems, flexible armored cables were used as bus duct feeders. Three-conductor, 300MCM cables leave the roof substations, run on trapeze hangers (on 5-ft intervals) in the roof trusses, then dip down to feed specific duct lines. Adequate space for future feeders is provided on the 1½-in. by 1½-in. angle-iron trapeze hangers.

Since the greater portion of the power load is of the inductive type, power factor correction was necessary. Installation of 81 capacitor bus "plugs" (15-kva, 8-fuse type) throughout the plant raised over-all power factor to 0.90, a 20 percent increase. The number of capacitor plugs per duct run was determined by the specific horsepower load. Each duct line is also equipped with a ground detector plug.

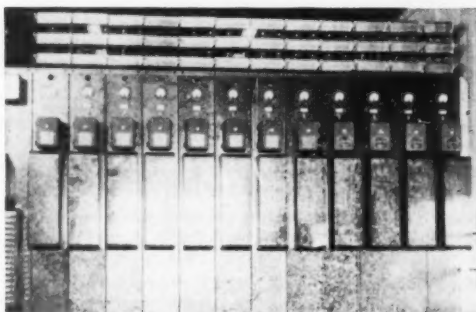
Added to the production machine power load is some 2,267 horsepower of air conditioning and ventilating facilities. Drawing air from offices, certain work areas, mezzanine, first aid station, locker and wash rooms, and test cells, are 115 dome-type roof exhaust fans. Of 41 supply



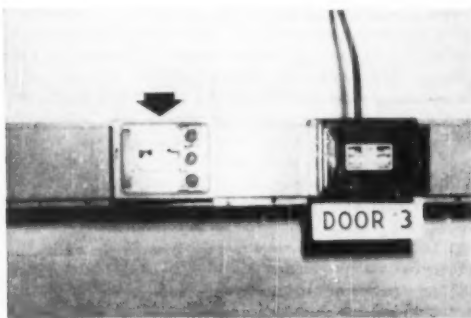
INDUCTION HEATING GENERATOR set. A 1,100 hp., 4,160-volt motor drives the 700 kva., 9,600-cycle, 875-ampere generator. Totally-enclosed unit is gas cooled. Note machine and circuit identification number.



POWER FOR ENGINE TEST cells is provided by bus duct line in basement



AUTOMATIC CHARGER PANEL for electric truck batteries. It takes five minutes to replace 2,800-lb., 750-ampere battery in truck by crane.



VISUAL INDICATION of grounds is provided by ground detector plug (arrow) on each duct line.

fans, located in 25 roof penthouses, the majority are driven by 40 hp motors; others by 25, 30 and one 50 hp unit. Seventeen of these fan penthouses each house a 150-kva, 440/120/208-volt lighting transformer to serve sections of the plant fluorescent lighting system.

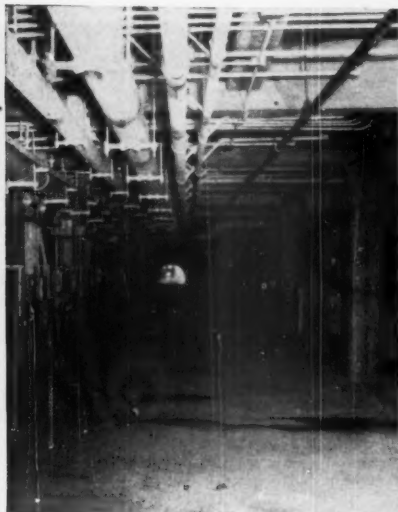
Electric cranes are operated on 440-volt, 3-phase power. In the special equipment and attachments storage area (parts in crates), the installation of a trolley duct crane feeder provides added safety to personnel. A 400-ft. run of 90-ampere duct feeds a three-ton, floor-operated crane that serves the area. Trolley wires for a larger bridge crane (two 7½-ton hoists powered by 10 hp motors) are semi-enclosed in an inverted metal trough. The 400-ft long trough has a ¼-in steel plate top riveted to 4-in channel iron sides; permits closer spacing of trolley wire insulators to prevent whip and sag; eliminates grounds and flashovers in case overhead sprinklers should operate.

Hi-cycle trolley duct provides power to various electric tools along the main and sub-assembly lines. A motor-generator set converts the normal 440-volt power to 220-volt, 3-phase, 180 cycles for these lines. The duct is mounted 12 feet above floor level and tools are suspended by spring balancers.

Air compressors and induction heating generators are served by a 4,160-volt distribution system from a separate substation. Each of the two 2,000-kva substation transformers carries one generator and one compressor to balance the load. Tie-breakers permit shift of transformer load in case of emergency. Induction heat treating generators are of the 700-kva, 9,600 cycle type; are driven by 1,100 hp, 4,160-volt, 3-phase motors. The totally-enclosed units are gas-cooled.

Feeders from the main generator room to the heat treating units on the cylinder and crankshaft lines consist of two two-conductor, co-axial cables, each conductor having a 750,000 cm capacity.

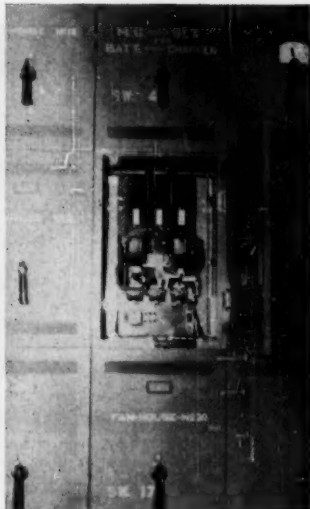
... Caterpillar of Peoria



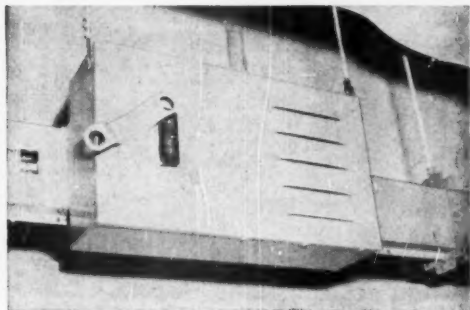
under cells. Note rack facilities for control equipment.



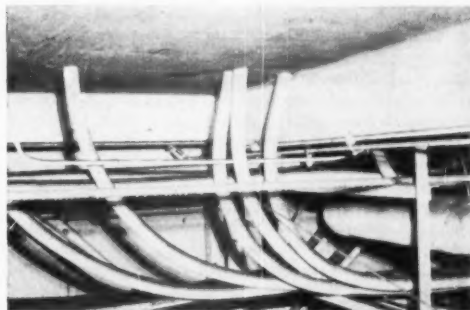
TROLLEY DUCT crane feeder (1) in storage area is energized by 440-volt, 3-phase bus duct run (2) directly above.



SECONDARY BREAKERS control power feeders. Note circuit identification painted on each breaker door.



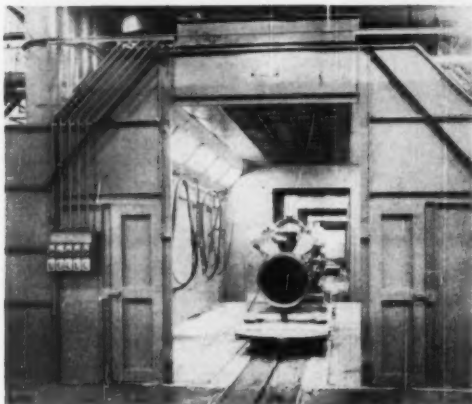
CAPACITOR PLUGS on bus duct lines maintain overall power factor at 90 percent. Number of units (15 kva., 8-fuse type) per duct run depends upon horsepower loading of duct.



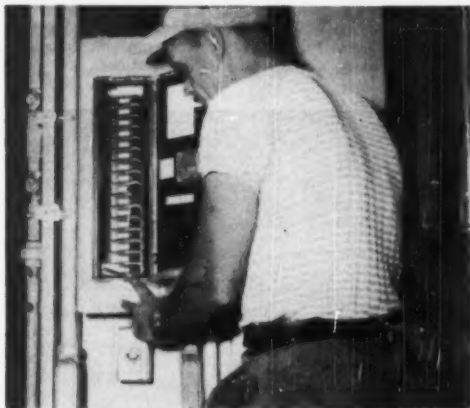
FLEXIBLE ARMORED CABLES drop down from substation floor; are carried on trapeze hangers in trusses.



HI-CYCLE TROLLEY DUCT over engine assembly lines feeds electric power tools which are suspended by spring balancers.



PAINT SPRAY ROOMS have high intensity illumination provided by a row of fluorescent units behind slanting glass panels on each side of enclosure.



COLUMN-TYPE PANELS mounted in column recess are used for lighting circuit control throughout the plant. Four spare circuit breakers are in each 16-circuit panel.

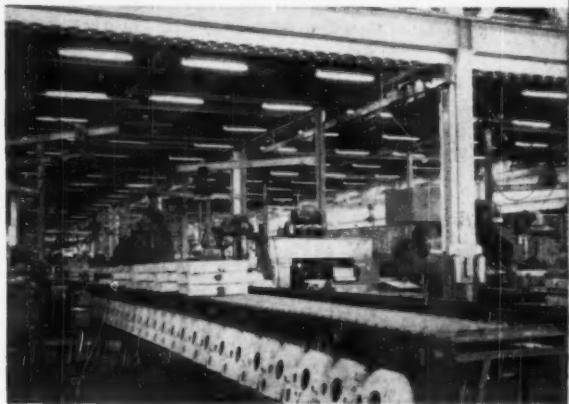
Lighting System

Throughout the plant proper there are 7,832 fluorescent fixtures to provide the desired 40 footcandles of illumination on the working plane. In general, fixture suspension is by means of 5/16-in messenger cables, on 12-foot centers, stretched taut from one building expansion joint to the other throughout the entire length of the structure. A turnbuckle at one end of each cable run takes up any sag which may develop. The cable is threaded through 1-inch eye-bolts mounted to the top of each truss chord. Cable clamps attached to the messenger on each side of the eye-bolt prevents slippage and maintains suspension in case a section of the cable should break.

Incorporated in the design of each 4-foot industrial type fixture is an 8-in wide by 3-in deep wireway to house the branch circuit conductors and necessary ballasts. Fixture



WELL LIGHTED REPAIR FLOOR in test cell area. Three-unit fixture sections are suspended in rows from ceiling. Illumination level is 40 ft.-c.



ALTERNATE SPACING on lateral rows of fluorescent units over bell housing line. Blank covers can be quickly replaced by additional fixture.

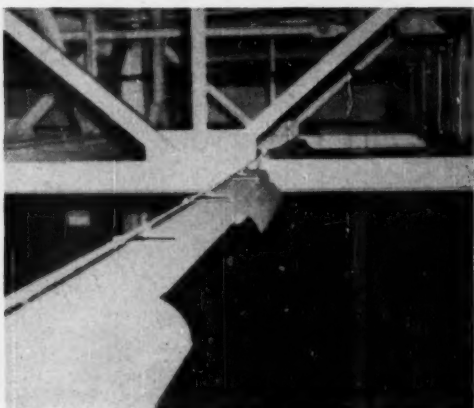
wireways are bolted together to form sections of three, four, and five units—depending upon the truss spacing—and mounted to the messenger cable spans. At truss chords, flexible conduit jumpers connect wireways.

Although the continuous-row wireway is used throughout the plant, fixture spacing follows two main patterns: 1) end to end; and 2) alternate spacing with 4-foot blank wireway between units. In the latter areas, lighting intensity can be increased by merely removing the blank wireway cover and adding another fixture. Adequate circuit capacity is provided by No. 12 minimum size conductors. Fixtures in the high-bay production and storage areas (20-foot, and 32-foot truss clearance) contain two 100-watt fluorescent lamps each; those in inspection, test cell, and mezzanine (12-foot clearance) areas contain three or four 40-watt tubes. Intensity in the inspection areas is approximately 50 footcandles.

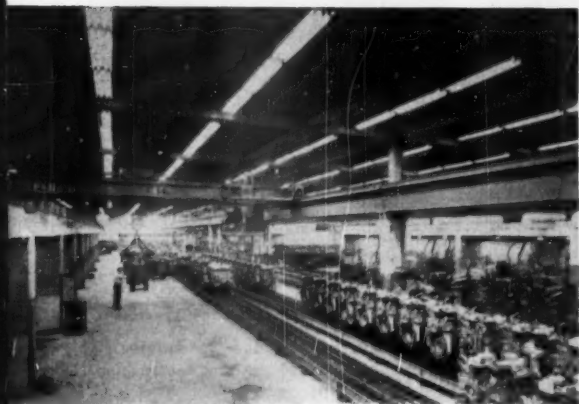
... Caterpillar of Peoria



CONTINUOUS ROWS of two-lamp, 100-watt fluorescent fixtures on 32-ft. mounting height illuminate rough stores area. Flexible conduit jumpers connect fixture sections.



MESSENGER CABLE suspends fluorescent fixtures flush with bottom of truss chord. Note continuous wireway with blank cover for future fixture if desired.

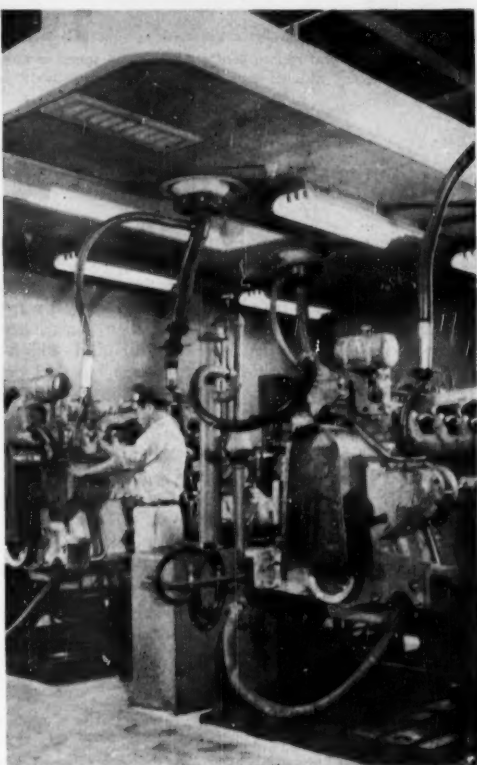


ROWS OF THREE-UNIT fixtures provide even illumination in conveyor aisles in front of test cells.

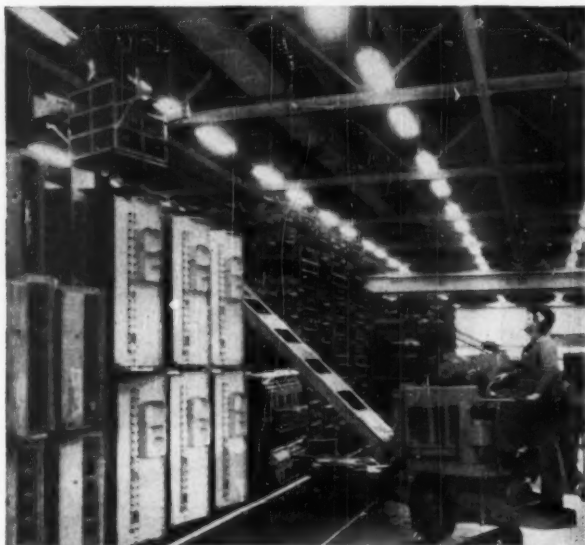
There is one branch circuit with overload circuit breaker protection for each 50 feet of fixture wireway. Branch conduits follow roof trusses back to column locations where they enter enclosed wireways extending up from column-type lighting panels. The wireways, protected from mechanical injury by the column flange, eliminate multiple conduit risers, provide additional ventilation and circuit accessibility. Lighting panels are 16 circuit type; have an average of four spare circuits each.

Illumination in engine test cells averages 40 footcandles; is provided by six industrial type fluorescent fixtures. Depending upon the size of the cells, fixtures contain two or three 40-watt tubes.

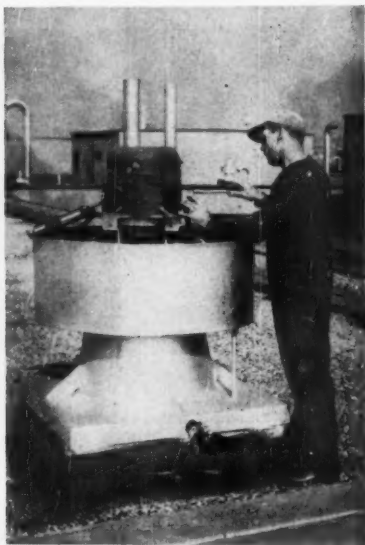
In the paint spray rooms, fluorescent units mounted at a 45-degree angle behind a flush continuous glass panel on each side of the room provide high intensity lighting. All circuit and control wiring to these rooms are in explosion-proof fittings.



INDIVIDUAL TEST CELLS are sound-proofed, contain six three-lamp, 40-watt, surface-mounted fluorescent fixtures on low ceiling.



BOOM TRUCKS and rolling scaffold platforms speed maintenance of the 7,832 fluorescent fixtures and 16,254 lamps throughout the plant.



ROOF EXHAUST FAN protective covers are easily removable for motor maintenance.

Maintenance Features

Throughout the design of this electrical system, maintenance economy received equal consideration with service continuity and operating flexibility. Among the installation features that make this apparent are: the easily accessible wireway column risers from lighting panels; bus duct power circuits for quick relocation and reconnection of machines; blank covers on fluorescent wireways for quick addition of fixtures; ground detector plugs on each bus duct circuit; temperature indicators on transformers; a bell and annunciator signal system in the maintenance office which gives audible and visual indication if trouble occurs in any of the substations.

To effect additional maintenance economies and safety to personnel, the maintenance department instituted a color code, circuit, and machine identification system. The following color code is used throughout the building:

Precaution Blue—bus ducts, conduits, exterior switch enclosures and electrical cabinets.

Alert Orange—interior of lighting cabinets, interior and exterior of industrial railroad switch boxes.

High Visibility Yellow—elevators, steel ladders, low overhead crane cabs, crane hooks, railings, curbing, edges of loading platforms and pits.

Fire Protection Red—emergency valves and fire protection equipment.

Safety Green—emergency shut-off valves and switches and first-aid station doors.

Electrical circuits are clearly identified from the main substation down to the operating equipment. Power distribution panels, located in areas where bus duct is imprac-

tical, have feeder voltage, circuit number, and substation number conspicuously painted on the face of the panel. Branch circuit control is identified by conventional nameplates. Painted on the cover exteriors of switches, magnetic contactors and other controls, are designations of the equipment served by the specific units.

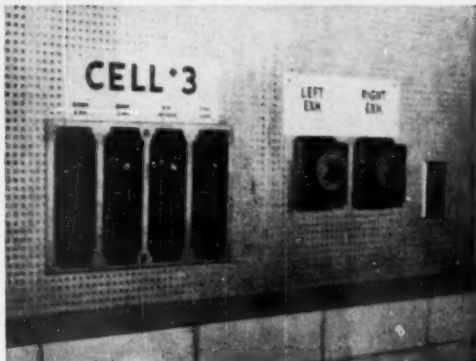
Each machine connected to the power system has an M-number (machine) painted in plain view. This same M-number, in large letters, appears on a metal sign attached to the bus duct under the plug feeding the machine. Where two machines are fed by the same disconnect (smaller motors), the duct sign carries both M-numbers. One man on power maintenance takes care of all circuit identification.

Conventional cards on the inside covers of the lighting panels identify the substation source for the feeder and branch circuits which the panel controls.

Two men devote full time to fixture cleaning and lamp replacement on the extensive fluorescent lighting system. They use a self-powered elevating platform and boom truck plus a light aluminum tubing rolling platform that can be completely assembled or disassembled in about five minutes.

Although all the electricians must have a general knowledge of the work, they must specialize in certain phases to assure efficient maintenance operation. Typical breakdown of crew assignments include: power, heat treat, and general maintenance. Normally a day and night crew is maintained.

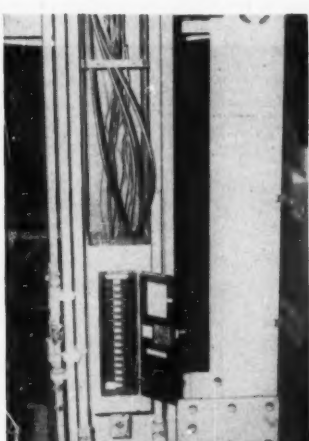
Lack of confusion and misunderstanding due to the extensive circuit identification scheme, plus the design features leading to maintenance ease, add up to an electrical maintenance operation that is efficient and economical.



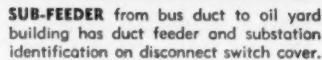
PUSH BUTTON CONTROLS in test cells have clearly legible circuit identification signs.



BANKED SWITCHES for paint spray rooms. Equipment controlled by each switch is clearly identified on outside of cover.



ACCESSIBLE WIREWAY risers from lighting panels (screw cover removed) reduce time required for circuit maintenance.



By
William Henry
Henry Electric Company
Saginaw, Michigan

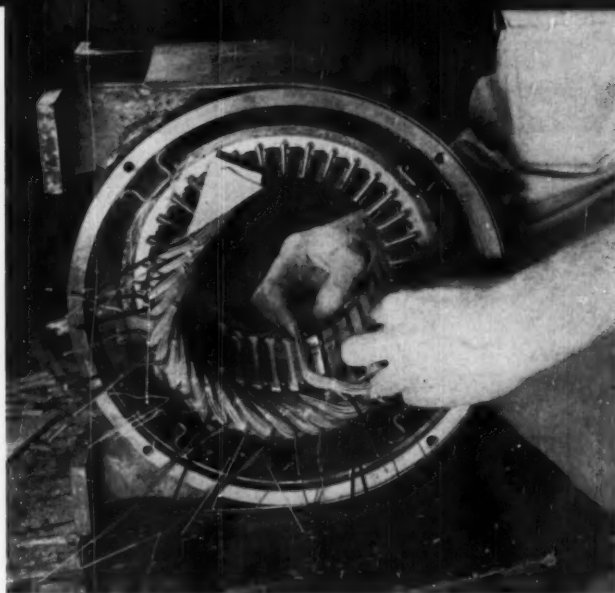
IN these days of increasing competition, it is important to know the exact cost of material and labor in relation to possible selling prices.

We must realize that there is quite a wide variation in material and labor costs in different parts of the country, but the relative cost of rewinding motors with Class A and Class H (silicone) Insulation should be reasonably constant.

About four years ago, we became interested in silicone insulation because we knew from experience that there was a definite need for heat-stable insulating materials for hard working motors. We felt, therefore, that we could give greater service and, at the same time, might attract new customers by making this type of insulation available. The hunch was a good one, for this phase of our business now constitutes from 10 to 15% of our total rewind business.

The cost analysis here presented is based on a Silicone (Class H) rewind job meeting the requirements of the AIEE. That means that the insulation consists entirely of inorganic materials in built-up form with binding substances composed of silicone compounds which will withstand continuous operating temperatures of at least 180°C.

In brief, the insulation of a complete silicone rewind job includes a 15 to 20 mil silicone-bonded glass-mica-



SILICONE (Class H) rewind consists of inorganic materials such as glass and mica in built-up form with binding substances composed of silicone compounds capable of withstanding continuous operating temperatures of 180 degrees C.

Silicone Rewind Costs

glass combination for slot liners. Where a feeder strip is desired, a 4 to 7 mil silicone varnished glass cloth is used. Coils are wound with double glass served, silicone-bonded magnet wire.

It should be noted that, since this data was gathered, the scrape abrasion resistance of silicone-bonded magnet

wire has been increased to equal or exceed that of the best organic bonded wire available. This increase in abrasion resistance should substantially reduce the time required to wind silicone stators.

For phase insulation and coil separators, a silicone-bonded glass-mica-glass combination is used. Slot wedges are cut from silicone-glass laminate sheet stock. It is frequently easier to use two pieces, each $\frac{1}{2}$ of the required thickness per slot, since this prevents damage to the slot liner and makes it easier to insert the wedges.

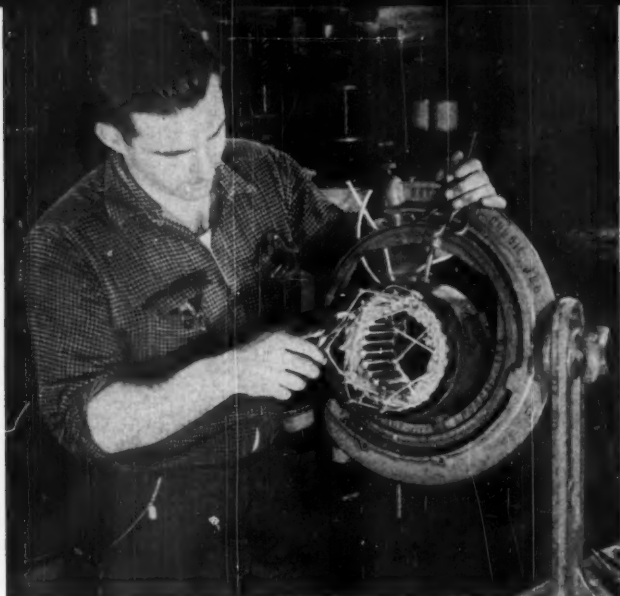
Silastic, glass braid insulated lead wire is used. Connections are made either with a high melting point solder or, preferably, by brazing, since brazing eliminates guess work where top ambient temperatures are unknown.

The wound stator is given two dips in DC 996 varnish and baked as recommended by the varnish manufacturer.

To keep an inventory of varnish at a minimum, a special dipping tank shaped to fit a 100 hp. stator can be built. Such a tank is cylindrical in shape except that one side is flattened to conform to the foot side of the motor. It is equipped with a tightly

T.F.C. MOTOR	COST						PROFIT				
	Material		Labor at \$1.50/hr.		Total		Vaughan Sale Price		Profit		Extra Profit Offered by Class H
	Class A	Class H	Class A	Class H	Class A	Class H	Class A	Class H	Class A	Class H	
2 H.P. 200	6.81	29.08	13.50	13.00	19.81	62.28	64.00	128.00	44.19	61.92	\$ 21.73
1 H.P. 1200	9.65	37.43	13.50	37.50	23.15	74.93	74.00	148.00	50.85	73.07	22.22
1 H.P. 1600	1.42	21.11	15.00	30.00	22.42	57.11	79.50	158.00	56.58	100.89	44.31
1 H.P. 1800	8.41	32.09	13.50	36.00	21.91	68.59	74.00	148.00	52.09	79.91	27.82
1 H.P. 2200	11.53	40.52	15.00	30.00	26.53	70.52	94.00	188.00	67.47	117.48	50.01
1 H.P. 3000	11.45	23.49	15.00	25.25	26.45	48.74	94.00	188.00	67.55	139.26	71.71
10 H.P. 1200	17.80	39.32	27.00	30.00	44.80	69.32	133.50	266.00	88.70	196.68	108.48
15 H.P. 1800	17.56	64.65	22.50	42.00	40.06	106.65	134.00	268.00	93.94	161.15	67.41
20 H.P. 3000	27.90	69.84	30.00	38.25	57.90	108.09	156.00	312.00	98.10	203.91	105.81
30 H.P. 4000	33.53	70.80	37.50	51.00	71.03	121.80	230.00	460.00	154.97	338.23	179.23
40 H.P. 2700	59.84	215.96	72.00	112.50	131.84	328.46	362.00	724.00	230.16	393.54	165.38
TOTAL	\$207,140	\$408,208	\$274,125	\$463,725	\$681,865	\$1,010,549	\$1,448,000	\$2,896,000	\$514,136	\$1,382,211	\$868,075

TABLE I—Relative Cost and Profit involved in rewinding motors of various horsepower ratings, comparing Class A with a Silicone Class H insulation.



GLASS BRAID insulated lead wires are connected by brazing, eliminating guesswork where top ambient temperatures are not positively known.

Customers pay twice as much for a Silicone (Class H) rewind as for a Class A job. In return, they receive from 4 to 10 times normal motor life. Shop costs increase. So do profits!

fitted cover and holds about 100 gallons of varnish.

With this amount of varnish, there is about 2 inch of space left at the top of the tank when a 100 hp. stator is dipped.

Motors are baked in an oven that has a top temperature of 450°F. Generally speaking, special oven equipment is not necessary to handle silicone insulation for DC 996 will cure at 300°, although we have found it more convenient to have an oven that can be operated at higher temperatures. Our motors are first baked for 12 hours at temperatures between 150°F. to 250°F. On the second dip and bake, these motors are baked at temperatures gradually increasing over an 8-hour period from 300°F. to 450°F.

During the final cure, the silicone insulated stators are removed and frames and end bells are painted with cad-moloth yellow silicone paint. End bells of explosion-proof motors are painted with chinese red silicone paint. These heat-stable enamels are then cured during the balance of the final bake. Silicone insulated motors are further identified by brass tags.

As noted, materials used were taken from actual shop orders and include

all necessary materials with the exception of paint for the frame, solder and bearing lubricants. The cost of varnish was included in figuring material costs for the motors. The cost of the organic varnish was not included in figuring Class A material costs.

The labor costs shown in this analysis include all of the time required for disassembling, stripping, cleaning and reassembling, as well as the time spent in making coils, cutting insulation, forming coils, winding, connecting and testing. A rough average of \$1.50 per hour was assumed for labor costs. This figure does not include supervision, fixed charges or overhead.

It will be noticed in the table that the material costs on a silicone rewind job range from about 2 to 4 times that of Class A materials. Labor costs for rewinding with silicone (Class H) insulation range from about 1.3 to 2.8 times the labor costs involved in rewinding with Class A insulation. We expect, however, labor costs will be almost equalized by such developments as the recent introduction of a higher scrape-resistant Class H magnet wire.

Even though material and labor costs are relatively high, the gross

(Continued on page 62)



DIPPING TANK is cylindrical except for one flattened side conforming to foot of typical motor. This permits conservation of varnish.



BAKING OVEN has top temperature of 450 degrees F. Generally speaking, special oven is not required, for DC 996 will cure at 300 degrees, although baking at higher temperatures speeds the curing cycle.

Generation Station Lighting

Windowless power plant combines truss-mounted mercury-incandescent assemblies with column-mounted series-wired emergency units.

MERCURY and incandescent lighting, for both normal and emergency use, provides illumination levels between 28 and 34 footcandles at turbine levels in the Harbor Steam Plant generation station of the Los Angeles Department of Water and Power located in Wilmington, California.

In the plant's 475- by 100-foot generation section, containing 5 main and 2 auxiliary units, combination mercury-incandescent assemblies are suspended flush with bottom roof-truss chords, 49 feet above the floor level. Each assembly includes a 750-watt incandescent and a 400-watt mercury Type-H lamp, housed respectively in Holophane fixtures numbered 990 and 993.

Mounting Data

Fixture assemblies are positioned along truss lines at 12½-foot intervals, with reflector yokes suspended from

gusset plates in the upper truss chords. Lighting circuits extend along the bottom chords, with flexible 12-gage Deltabestos laced cables rising to feed each lighting assembly and with a two-lamp auto transformer (for mercury lamp operation) located beneath every second assembly.

Color Blending

For reasons of color blending, incandescent and mercury lamps are staggered from side to side along each truss line. Trusses are on 25-foot centers. The lighting load for this installation is 3.65 watts per sq. ft. Lighting equipment is maintained from the 125-ton traveling crane that spans the 100-foot-wide turbine area.

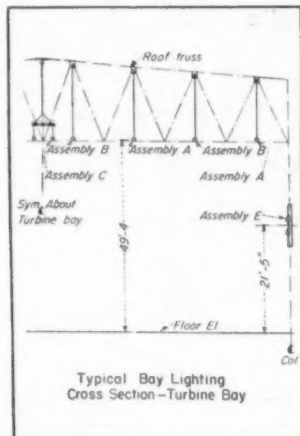
Since there are no exterior glass areas and natural light is excluded, it is imperative that secondary lighting on separate circuits be available for daytime as well as night-time emergency service. This is provided by

deep bowl 2-lamp 150-watt incandescent units suspended at truss-height in the center of each 25-foot bay, and by twin 150-watt Holophane incandescent flush units on 2½-foot centers mounted on each column at elevations 21 feet above the floor. All emergency lighting circuits are 2-wire in series for 250-volt operation.

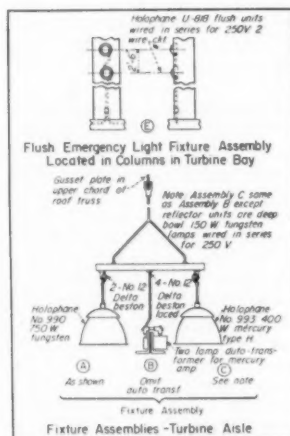
Emergency Spots

Provision for the operation of emergency spotlights, to illuminate the control boards, is made by the installation of 20-amp Twistlock plug receptacles (also series wired) located on the two center roof trusses equidistant from the sides.

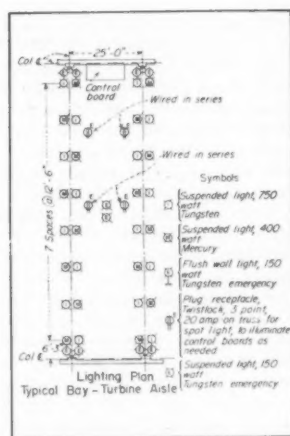
Equipment in the generating station is painted with a light grey synthetic switchboard enamel having a reflection factor of 75%. Walls and ceiling are ivory (also with a 75% RF), while cement floors are tile-colored (30% RF).



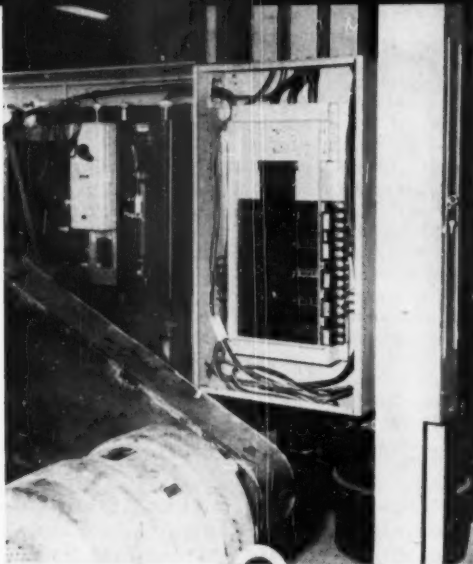
MERCURY AND INCANDESCENT units are staggered at 12½-foot intervals along each roof-truss line to achieve color blending. Lighting load is 3.65 watts per sq. ft. for this installation.



TWIN REFLECTORS are suspended from gusset plates in upper chords of trusses. Two-lamp auto transformers are located on lower chords beneath every second assembly for operation of mercury lamps.



CIRCUIT CONNECTIONS for 2-lamp truss-mounted assemblies are through laced Deltabestos 12-gage wires. Emergency lighting units are series connected with 2-wire circuits for 250-volt operation.



PANELBOARD, pictured during installation, indicates the use of square metal wire raceways, circuit-breaker panels, wide wiring gutters and narrow column-type lighting control centers.



RELAY SWITCHES make it possible to control pump motors from several remote positions. Here, the author has removed several dead-front panels to reveal intricate wiring, part of the electrical contract.

EXPLOSION-PROOF CONTROL

Extensive safety wiring, intricate relay controls, a modified loop distribution system and large-scale motorization of production processes are features of interest in the new International Printing Ink plant, installed by electrical contractor Edward J. White of Newark, N. J.

THE most extensive electrical project in the history of Elizabeth, N. J., has just been completed for International Printing Ink, a division of the Interchemical Corporation of New York City. Here, the distribution system was planned in accordance with latest safety provisions, and, so that related operations in different parts of the plant can be synchronized and controlled from any one of several stations, considerable use is made of relay switching and automatic regulation. Motorization, also, is extensive.

Because of the nature of ink manufacturing operations, the electrical installation rigidly follows Code provisions for hazardous locations and, although explosion-proof construction is required in only a small section of the plant, this part of the installation is of particular interest electrically. Safety is constantly stressed—with closed containers used for storage of liquids, and closed systems used to distribute liquid products. The varnish

By Charles D. Wetherbie

*Sales Engineer
Edward J. White Company
351 Broadway
Newark, N. J.*

plant, well isolated from the remainder of the plant, is entirely of explosion-proof construction.

For added safety, electrical control equipment is frequently located at points removed from the equipment they govern. In no case is electrical apparatus installed where ignitable residues are present, except with the safeguards of rigid conduit, tapless boxes and fittings, spliceless wiring and sealed terminal connections. Lighting is through gasketed glass enclosing globes or panels, many of which are doubly protected with wire cages or guards.

Extensive use is made of explosion-proof instrument conduits, pull and junction boxes, flexible couplings and expansion joints. Also, to prevent the

passage of gasses, vapor or flame from one portion of the system to another, seals are used adjacent to all enclosures housing switches, circuit breakers, fuses, relays and resistors. Sealing compounds were specified with melting points above 200-degrees F, and thicknesses of compound seals were maintained equal to the diameter of the conduit they closed. Motors in hazardous areas are either explosion-proof or are minus arcing contacts or brushes.

Extensive Control

Electrical controls are used for safety, close regulation, convenience and necessity. For many motors must be operated from distant points and, in many instances, the same motors are controlled from several widely-separated control centers.

This can be illustrated by a passing reference to one of many steps in the process of ink manufacture, a step which combines two or more liquid

raw materials to give an ink its desired printing characteristics prior to the addition of color. In all, the IPI plant uses 18 such materials, stored at a "tank farm" and piped to various mixing points located throughout the plant. So that pumps will not operate unless a mixing valve is open, pipe lines at the several mixing points are fitted with hand-operated valves. These valves mechanically activate limit switches, preventing the closing of starting switches at these points unless associated valves are open. Also, so that the same liquid materials can be controlled from pushbutton stations variously located at weigh tanks, blending tanks, the tank room proper or the mixing areas, control wiring from each of these positions extends to central motor control centers. From these centers, relays activate the pump motors located at the "tank farm" and the desired materials are pumped to the stations requiring their use.

This single installation includes 11 watertight jog-stop stations at the tank farm and 3 start-stop explosion-proof stations in the main pump house. In addition, the main motor control center in the pump house (totally enclosed, dead front) has four sections; one with starting equipment for five motors, one with starting equipment for four units, one for the main breaker and a spare. Inside the plant proper, the main motor control switchboard includes 48 double-contact relays, 6 motor starters for pumps and a 2-speed starter for a set kettle agitator. Fifty-two local control stations are variously located in kettle rooms, at drum-up stations, in charging areas and in

intermediary tank room. Local control stations are explosion-proof with the required pushbuttons and pilot lights included. Over 10,000 feet of control wiring was used to connect local control stations with plant-based motor control switchboard.

Another interesting wiring installation is that of an explosion-proof crane. Power is obtained through a flexible cable, one end of which is connected to the take-up reel of a constant-tension reel unit at one end of the crane run, while the other end is connected to a small outrigger assembly on the moving crane. The cable is clamped to the outrigger by means of U-bolts, with cable protection being provided by short lengths of split fiber tubing. Running the full length of the crane travel and located just below the path of the moving crane outrigger, a 6-inch wide channel is installed to carry the power cable and, to minimize friction as the power cable moves with the crane, the channel is fitted with ball-bearing rollers on 12-inch centers. Both the crane rail and the cable trough are suspended from the roof trusses.

Controls—remote, often explosion-proof, using relays, thermostatic elements, photoelectric cells, or other means of activation—also govern unit heaters, unit ventilators, motor operated doors, overhead hoists, research printing presses and some of the lighting installations.

Loop Distribution

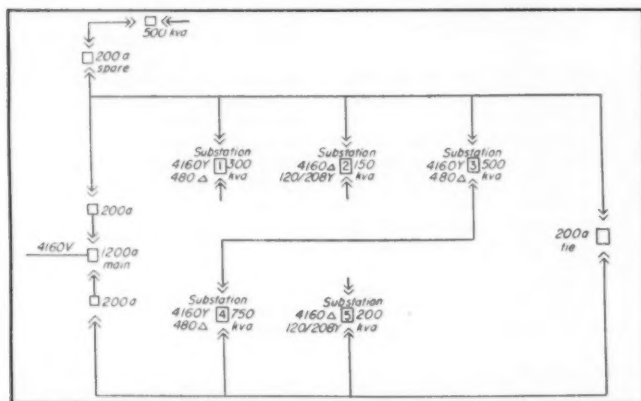
Distribution of power is by a modified loop primary radial system, with a secondary tie connecting the low-

voltage sides of the two largest 480-volt substations. By this arrangement, any transformer may be disconnected from the loop in the event of fault, without disturbing the balance of the system. With power breakers on either side of each transformer, current can be carried to any substation by any one of three routes.

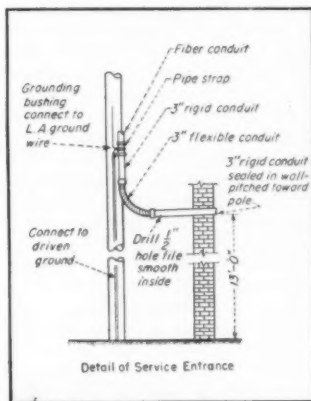
Utility service at 4160-volts, 4-wire, 3-phase, 60-cycles, is brought to the plant by overhead lines and is carried to the main switchboard through an assembly of fiber, rigid and flexible conduit. Main switchgear, consisting of dead-front cubicles, includes a 4-pole gang-operated disconnect mechanically interlocked with a 1200-amp 50,000 kva 3-pole manually operated oil circuit breaker, metering and recording equipment, and two electrically-operated dual overload trip air circuit breakers protecting the two segments of the interplant loop system. The switchboard, erected on channel sills lagged to the floor, is thoroughly grounded through ½-inch square copper bus.

Substations—five in number—include three 4160/480-volt wye-delta power units of 750-, 500- and 300-kva capacity, and two 4160/120/208-volt delta-wye lighting stations of 200- and 150-kva capacity. Each substation is a complete power center, including primary electrically-operated draw-out air breakers, a dry-type air-cooled transformer, a meter panel (including a 3-lamp phase-designating ground detector), and the required number of secondary feeder circuit breakers of the plain overload trip, dead front, manually operated type.

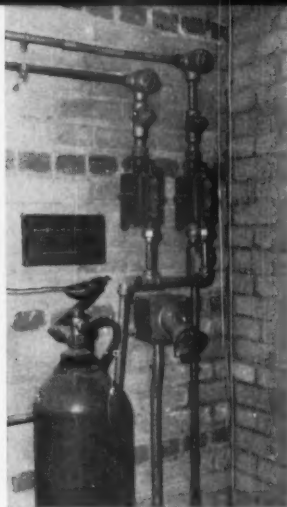
Lighting panelboards are heavy-duty



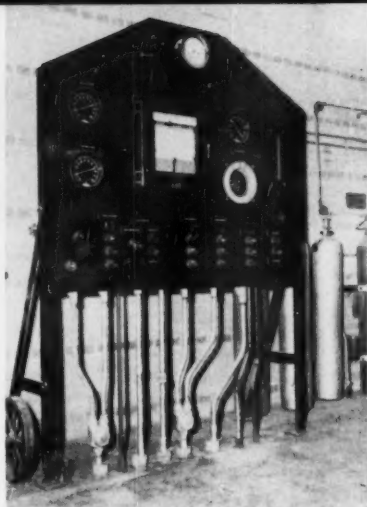
LOOP DISTRIBUTION is used to carry 4160v. primary current to five substations (2 for 120/208v. service, 2 for 480v. use). A secondary tie is also provided for added distribution security, connecting the low-voltage sides of the two largest 480-volt substations.



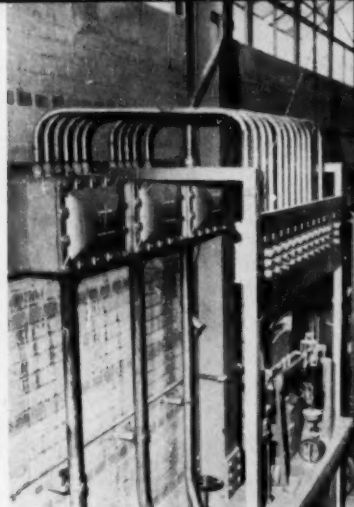
SERVICE ENTRANCE combines the use of fiber, rigid and flexible conduit. Entrance to plant through brick wall is pitched slightly upwards and sealed.



SAFETY is insured by carbon-dioxide tanks. When manually released, the gas can be used to simultaneously extinguish a blaze, sound an alarm and disconnect all electrical circuits.



CONTROL PANEL for varnish kettle is explosion-proof, including heat recording and controlling instruments, pressure switches, thermocouple leads, indicating lights and pushbutton stations for pumps, fans and agitators.



EXPLOSION-PROOF wiring in hazardous locations includes rigid conduit, tapless boxes and fittings, spliceless wiring and sealed terminal connections.

de-ion breaker units having three main busses with lugs and a solid grounded neutral. Cabinets are of two types; narrow column and flush-mounted vaportight assemblies. In the case of the column cabinets, the neutral bus is contained in a ceiling-level junction box. Wire duct extensions run between the flanges of the H-columns from junctions to panels.

In general, Type R wire is used for light and power circuits within the buildings. Exposed exterior conduits carry type RW wire, while underground conduits carry RL 600-volt lead-covered wire. Service wiring for

4160-volt distribution is Type V, varnished-cambrie insulated, flame-retardant braid-covered, with grounded neutral. Wire sizes are 12-gauge and larger; 10-gauge where circuits exceed 100 feet in length.

For 480-volt power distribution, extensive use is made of 4-by-4 inch metal raceways, while 2½-by-2½ inch square duct is installed above furred ceilings in laboratory sections for low-potential distribution. Wide use is also made of rigid conduit, EMT (lighting circuit), flexible conduits (for motor connections where movement or vibration is present) and fiber duct

(yard floodlights). In the office sections, underfloor duct is used for 120/208-volt power, telephone and signal wiring. Preset outlets are on 2-foot centers and circuits of high and low potential are run in separate channels.

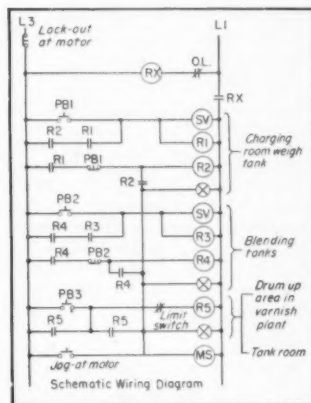
As previously mentioned, wherever explosion-proof, distribution is required, special junction conduits, suspended lighting fixtures, interlocked receptacles and switches, tumbler switches, flexible couplings and sealed power connections are included.

Plant Lighting

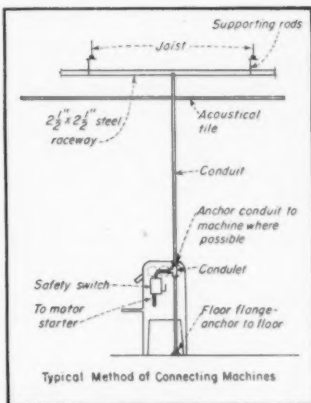
Lighting is both incandescent and fluorescent. The incandescent fixtures include RLM standard domes, explosion-proof domes, shallow square recessed specular-reflector lensed units, and multiple-unit floodlights for exterior illumination. Fluorescent fixtures include open troffers, with and without baffles, commercial eggcrate luminaires and vaportight 4-lamp assemblies for laboratory installations.

In addition to installing distribution and control equipment, wiring and lighting fixtures, the electrical contract included the installation of paging, intercommunicating, ADT, autocal and clock networks. In scope, the completed electrical project constitutes the largest single installation ever to be installed in the city of Elizabeth.

The electrical work, designed by A. M. Kinney, Inc., consulting engineers of Cincinnati, Ohio, was completely installed by the Edward J. White Company of Newark, N. J.



RELAY WIRING diagram shows versatility of control possibilities, with pushbutton stations located near tanks as well as in storage room.



CONNECTIONS between distribution raceways and machines subject to motion or vibration are by means of conduit drop secured to floor with flange.



PLASTIC LOUVERS and fluorescent lamps form luminous ceiling at Seibert Motors, Rochester, N. Y., and modern . . .

. . . Lighting Technique for Auto Display

LIGHTING for the effective display of automobiles requires a high level of well diffused illumination, supplemented by direct light from a concentrated type light source. The diffuse illumination lights the highly polished curved surfaces of today's modern car without distorting reflections of the light sources, while the direct light from concentrated light sources adds sparkle and glitter to polished chrome surfaces. Seibert Motors, Rochester, N. Y., has achieved a highly satisfactory lighting result in its remodeled showrooms, through the installation of both diffuse and direct lighting to produce these effects.

Louverall ceiling provides 60 footcandles of shadowless illumination in display room of Seibert Motors, Rochester, N. Y.

By Walter N. Parkes

*T. H. Green Electric Co.
Rochester, N. Y.*

Diffuse illumination is provided by a Benjamin Sky-Glo louverall ceiling, using 2-lamp channels and reflectors for 40-watt T-12 3500° white lamps above the translucent plastic louver sections. Intensity is 60 footcandles.

A large dome was installed in the center of the ceiling for two reasons: 1) to break up the large expanse of the luminous louvered ceiling, and 2) to provide an attractive means of lighting a single car for all-night display. Six 200-watt Pittsburgh reflectors were recessed in the dome to provide this all-night display lighting. These units also add the desired sparkle to polished metal surfaces when the louverall lighting is in use.

The louverall ceiling was selected because of its diffusing quality, and also because it provided a means of

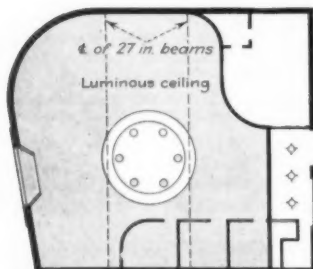
concealing two large 27-inch deep beams installed across the ceiling of showroom, and required to support the second floor.

The plaster ceiling above louvers was painted white, 75% RF; side walls are light finished panels and wall paper, 40% RF; and the composition floor is dark red, 20% RF.

Architect for this remodeling job was Carl Maynard. Norman T. Kridel, Rochester Gas & Electric Corp., co-operated in the design of the lighting system, and T. H. Green Electric Co. were the electrical contractors, all of Rochester, N. Y.

TECHNICAL DATA

Type of Work	Auto Sales
Construction	Remodel
Area (Sq. Ft.)	2500
Luminaire Mounting Height	12 Ft.
Light Sources Fluorescent & Incandescent	
Size Lamps	200 w & 40 w T-12
Luminaires	Benjamin Louverall
Watts per Sq. Ft. (Louverall Only)	4.1
Illumination (Footcandles)	60
Cost per Sq. Ft.	
a. Lighting Equipment	\$2.25
b. Electrical Work	3.20
c. Total (All Lighting & Electrical)	\$5.45
Percent, Lighting & Electrical to Total	13%



LUMINOUS CEILING is installed 12 feet from floor, and conceals two 27-inch deep beams extending across entire room.



PERMANENTLY FORTIFIED
for Life-Time Wiring Protection

Unlike ordinary rigid steel conduit, SHERARDUCT is fortified—*permanently fortified*—against rust and corrosion by the Sherardizing Process of dry galvanizing. A pure zinc coating, driven into the pores of the steel, becomes an integral part of the tube itself because it's *alloyed with the steel*. Furthermore, SHERARDUCT will not split or peel, and although it can be bent easily, it will not crack!

SHERARDUCT is still further protected against acids and other corrosive agents by the clear "Sbera-Solution" coating, baked on for added endurance. The smooth inside surface makes fishing easy.

Specify SHERARDUCT. It's full weight, threaded, rigid steel conduit—*fortified to give wires and cables a life-time of protection.*

Sold through leading electrical wholesalers.
Listed by Underwriters' Laboratories, Inc.

National Electric
PRODUCTS CORPORATION

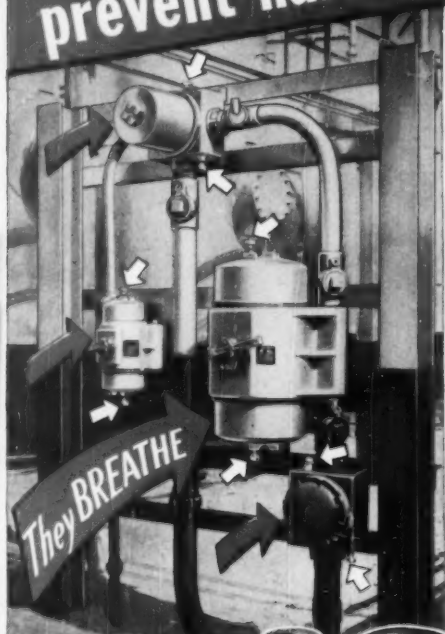
1301 CHAMBER OF COMMERCE BUILDING, PITTSBURGH 19, PA.

EVERYTHING
IN WIRING
POINTS TO
NE



CROUSE-HINDS Breathers

prevent harmful water condensation
in explosion-proof
electrical conduit systems
under humid conditions



- ▶ **FORESTALL** the formation of destructive mildew by ventilating enclosures.
- ▶ **EXTEND** the **LIFE** of insulation and equipment under adverse conditions.
- ▶ **MINIMIZE** the danger of expensive shut-downs due to insulation or equipment failure.

Paragraph 5015-C5 of the 1947 National Electrical Code states that "where there is a possibility that water or other condensed vapor may be trapped at any point in the raceway system, approved means shall be provided to prevent accumulation, or to permit periodic draining of such water or condensed vapor"

Explosion-proof electrical enclosures cannot be vented in any of the usual ways because they must be kept flame-tight. Crouse-Hinds' explosion-proof Type ECD Breathers, Type ECD Drains, and Type ECD Drain Sealing Condulets meet the Code requirements and are listed by Underwriters Laboratories for such service.

The Breathers are similar to the Drains but have metal hoods which make them water and dust shedding. Both have corrosion-resisting bodies with internal flame-tight (but not airtight or watertight) labyrinth. They can be used freely without impairing the explosion-proof integrity of a conduit system, providing they are always installed in a Condulet hub or other opening with five or more full threads engaged.

In humid atmospheres, water condensation occurs in explosion-proof systems, especially where temperature changes are frequent. Accumulation of water in harmful quantities is common. Mildew, a bacterial growth, is often present. It attacks many insulations and will destroy them unless the cause is removed. In such humid atmospheres troubles of this nature can be avoided by the proper installation of Crouse-Hinds' Breathers and Drains in conjunction with explosion-proof Condulets.

Breathers should be placed at the highest points and Drains at the lowest points of all housings and conduit runs. Heat generated by the current flowing through conductors and electrical devices raises the temperature of air within the conduit and housings. Breathers and Drains permit the resultant upward passage of the warmed air to remove moisture and thoroughly ventilate the enclosures. This prevents the accumulation of water and removes moisture that may have collected under unusual conditions.

This method is successfully used in many of the largest plants in the chemical and petroleum industries. Several years of field experience has demonstrated that the moisture is either entirely removed by ventilation, or so reduced that it is not harmful.

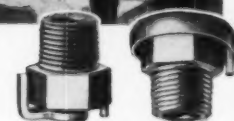
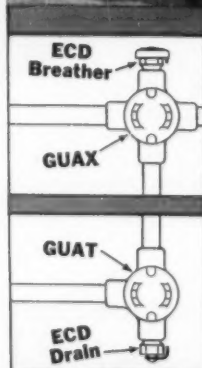
These devices have also been successfully used in non-hazardous locations where condensation is troublesome.

If you have a condensation problem, Crouse-Hinds Company will gladly assist in solving it. Write to

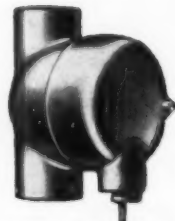
CROUSE-HINDS COMPANY Syracuse 1, N. Y.

Offices: Birmingham—Boston—Buffalo—Chicago—Cincinnati—Cleveland—Dallas—Denver—Detroit—Houston—Indianapolis—Kansas City—Los Angeles—Milwaukee—Minneapolis—New York—Philadelphia—Pittsburgh—Portland, Ore.—San Francisco—Seattle—St. Louis—Washington.
Resident Representatives: Albany—Albany—Baltimore—Charlotte—New Orleans—Richmond, Va.
CROUSE-HINDS COMPANY OF CANADA, LTD., Main Office and Plant: TORONTO, ONT.

* CONDULETS are made only by CROUSE-HINDS



CONDULETS with Crouse-Hinds Breathers and Drains can be installed for ventilation throughout an entire explosion-proof conduit system



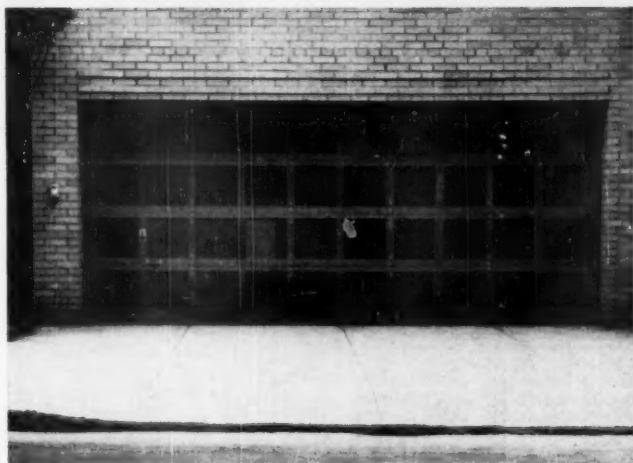
Type ECD Explosion-Proof
Drain Sealing Condulet

A
Nationwide
Distribution
Through Electrical
Wholesalers

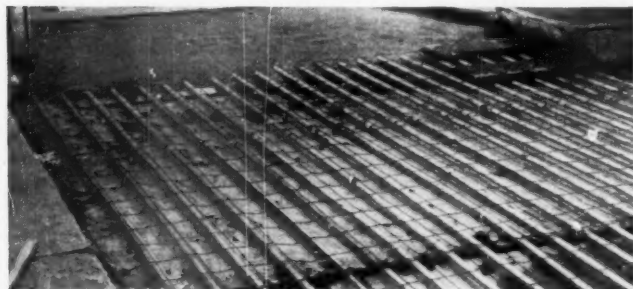


CONDULETS • TRAFFIC SIGNALS • AIRPORT LIGHTING • FLOODLIGHTS

Practical Methods



GARAGE DRIVEWAY of a Brooklyn, N. Y. doctor is kept clean of snow in winter by . . .



. . . **ELECTRIC HEATING CABLE**, installed in conduit and buried in the concrete.

Electric Heat Removes Snow

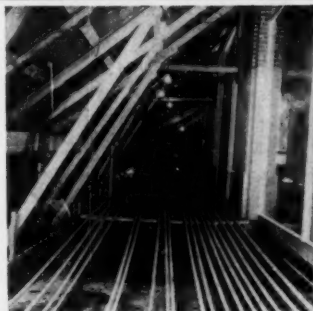
To remove snow from your sidewalk, garage entrance, or driveway, simply flick a switch! That's the advice of Mario F. Muzzillo, consulting engineer in New York City, who has designed and specified several electric radiant heating installations for snow removal. Some of these installations have been in use for three winter seasons, and have proved to be convenient, inexpensive to operate, and most satisfactory.

These installations use an electric heating cable, placed within rigid steel conduit, and buried in the concrete sidewalk or garage entrance, or in the ground under the entrance driveway. Dissipation of electrical energy in the

cable provides the heat required to melt the snow from the area where the cable is buried. The conduit affords protection to the cable, and also makes cable replacement an easy job should a cable failure occur.

A typical snow removal installation consists of a one-inch galvanized conduit so spaced as to carry a load of 32 watts per square foot. This loading has been found sufficient to melt a snowfall of one inch per hour at an air temperature of 26° F., considered adequate for the New York City area.

To obtain this loading the conduits are spaced six inches on center, and buried approximately one and one-half inches below the surface of the con-

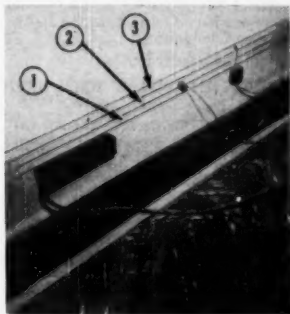


SIDEWALK at the Rockland Light & Power Co. building in Nyack, N. Y., is equipped with electric heating cable in galvanized conduit to eliminate collection of snow.

crete. The conduits terminate in a pull box which contains copper terminal strips for the cables.

Lead-sheathed heating cable is used, and is available in 60-foot lengths for 120 volt service, or 120-foot lengths for 240 volt service. The 60-foot length consumes 420 watts, and develops a maximum sheath temperature of 165° F.

Installation costs in the New York City area have averaged about \$2.00 per square foot, according to Mr. Muzzillo. The annual operating cost for approximately 1000 square feet, over a period of 100 hours at two cents per kw-hr., is estimated at \$64.00.



TRIPLE-CHANNEL RACEWAY around baseboard in the office of Guarantee Electric Company, St. Louis electrical contracting firm, serves (1) office intercommunicating system; (2) 110-volt receptacles for office machines; and (3) telephones. System consists of two tiers of plug-in type metal molding with a quarter-round finish metal molding on top; is painted to blend in baseboard.

Always

USE THE BEST

Made only by
**CHAMPION
DEARMENT**

Channellock pliers are listed in the
Yellow Pages of most Telephone
Directories under "Tools"



Use CHANNELLOCK PLIERS

If you want the best . . . and all good craftsmen do . . . insist on Channellock pliers. It's the most versatile tool in your bag. Whenever you use pliers, you'll find that easily adjusted, strong Channellocks will do the job better and faster.

Channellock pliers are made Only by Champion DeArment, for more than 65 years manufacturers of highest quality tools.

Don't just ask for pliers . . . Ask For Channellock Pliers. You'll like 'Em.

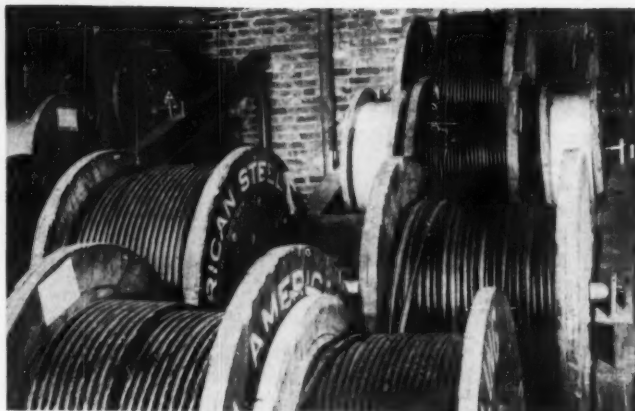
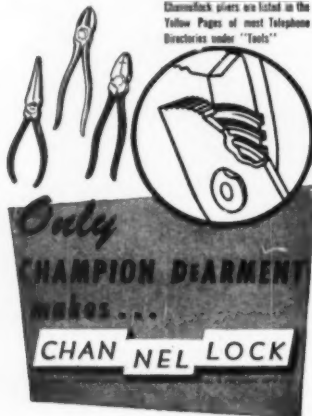
And remember—Only Champion DeArment makes Channellock.

Send for Catalog D9 today.

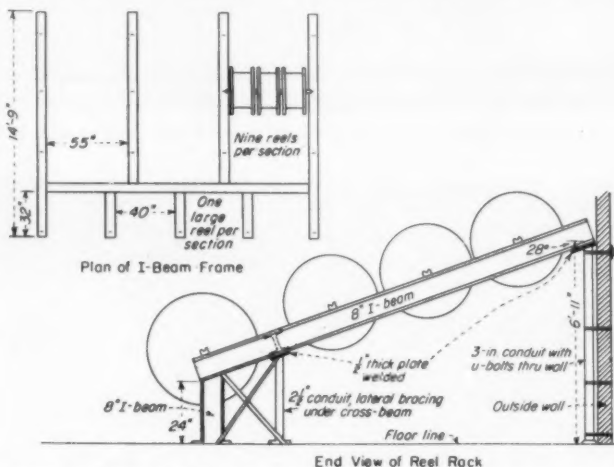
CHAMPION DEARMENT TOOL CO.

Meadville, Pa.

Channellock pliers are listed in the
Yellow Pages of most Telephone
Directories under "Tools"



EASY PAYOUT is feature of this inclined storage rack for heavy cable reels. Frame is made of 8-inch I-beams; holds 31 reels of different size cable.



PLAN AND END VIEWS of rack construction with dimensional data. Note storage area available under inclined frame.

Reel Rack for Heavy Cable Payout

MATERIAL STORAGE

Practically every electrical contractor maintains a substantial inventory of insulated building wire to expedite material shipments to construction projects. Common practice on large jobs is to order long heavy cable runs cut to length and delivered with the three legs on each reel. However, many contractors specializing in industrial work keep a large quantity of various sizes of heavy cable on hand. Feeder lengths for short runs are normally cut and coiled in the shop for delivery to the job.

Storage and payout of branch circuit sizes are relatively simple. The large reels present the problems. Because of their weight and bulk, they

are difficult to maneuver into position for payout in the warehouse area.

One practical solution to this problem was evolved by J. K. Stuessell, general manager of Wente Construction Co., Inc., electrical contractors of Hamilton, Ohio. He designed a heavy steel I-beam rack which holds 31 reels of the more commonly used sizes of heavy conductors. The reels rotate on steel bars supported by the inclined rack.

Features are: immediate access to the cable; clear space for payout of individual conductors; no juggling of reels; and additional storage space under the rack area.

The basic frame is constructed of

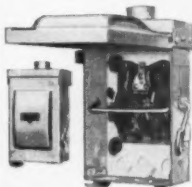
The Cutler-Hammer Type D Line

Broad Range of Sizes Types and Enclosures

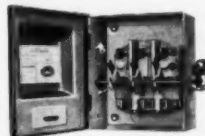


Type D 30 amps,
2 poles fusible, for plug
fuses. Single throw.

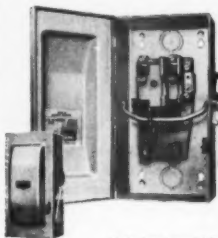
Type D 30 amps, 3 wire,
solid neutral, for plug fuses.
Single throw.



Raintight Type D 30 amps,
3 wire, solid neutral,
for plug fuses.

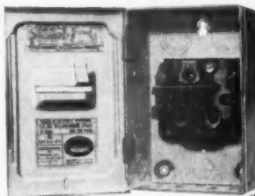


For N.E.C. fuses... Type D
30 amps, 3 poles, fusible.



For N.E.C. fuses...
Type D 60 amps, 3 wire,
solid neutral, fusible.

Raintight for N.E.C. fuses
... Type D 30 amps, 3 wire,
solid neutral.



D-Puller Front operated—
Type D for N.E.C. fuses, 60 amps,
3 wire, solid neutral.

D-Puller Front operated—
Type D for plug fuses,
30 amps, 2 poles.



cost-cutting
SAFETY SWITCHES
to answer many problems

The Cutler-Hammer Type D line of General Duty Safety Switches is popular with electrical contractors and wholesalers because it has so many uses in so many places. These inexpensive quality products have ready acceptance for use with workshop tools, oil burners and stokers, laundry appliances, air conditioning and refrigerating units, feed grinders, compressors... in home, shop, farm, commercial buildings, and for service entrance too. Job requirements for heavy duty lighting circuits are amply met by the larger capacity Cutler-Hammer Type D Switches.

Quality Products at No Extra Price

These General Purpose Switches are built, as all Cutler-Hammer Products are built, not down to a price but up to a standard of excellence that is known wherever electrical products are used. Some of the construction details that tell you why the Cutler-Hammer reputation is well-deserved are given below.

Features that Mean Better Performance on the Job

"Easy-tight" wire holes on terminals provide quick, solderless connections. Inorganic base will not carbonize or disintegrate, dissipates heat developed by fuse wattage, results in cooler operation. Double faced contacts with wiping, self-cleaning action insure cool, continued performance. Single break; no needless overloading of switch mechanism. Sturdy shock resistant cases. Provision for padlocking in "off" position, ample concentric knock-outs, ample wiring space. These are some of the many quality features of the C-H Type D Line.

Dependability that Has Established C-H as Standard

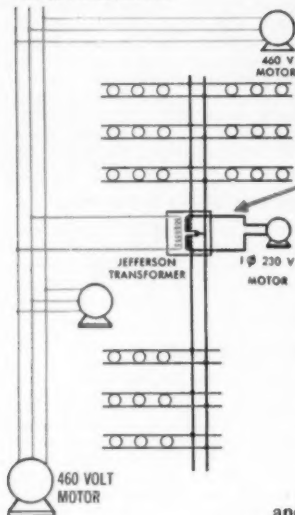
Whenever and wherever electrical men want reliability, they insist on Cutler-Hammer Safety Switches, carried in stock—by distributors everywhere. CUTLER-HAMMER, Inc., 1306 St. Paul Ave., Milwaukee 1, Wisconsin.





RUN ONLY HIGH VOLTAGE CIRCUITS Throughout Plant or Building

460 VOLT
THREE PHASE SERVICE



**Install Dry-Type
Jefferson Electric
Power Circuit
Transformers
for the Lower
Voltage Circuits . . .**

Operate lighting load, fractional H.P. motor and appliance from 460-Volt Power lines by use of Jefferson Power Circuit Transformers for reducing voltage to conventional 115/230 Volts single phase at usage points. This system may be employed in new buildings, saving conduit, copper and manpower, or in old plants where power increases require larger lines to carry the load. In the latter case a 230/115V system can be changed to 460-Volt

and carry twice the load previously carried while using the same wires and the same conduit already installed. Furnished with brackets for wall mounting and wiring compartment with knockouts for BX or Conduit. Available from stock in capacities from .050 to 15 KVA inclusive. Approved by Underwriters' Laboratories.

For complete data refer to Bulletin 461-PCT.

JEFFERSON ELECTRIC COMPANY,
Bellwood, Illinois. In Canada: Canadian Jefferson Electric Co., Ltd.,
384 Pape Ave., Toronto, Ont.



**Dry
Type**

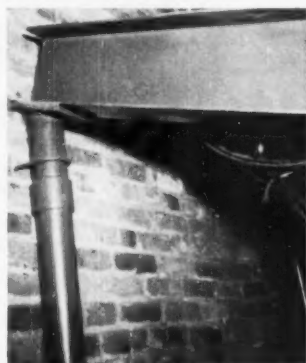


**Power
Circuit**

TRANSFORMERS



TRUNNION SUPPORTS reel rods on inclined frame. Stop block on outer beam keeps rods from slipping. Note spacer collar between reel and trunnion.



CONDUIT PEDESTAL supports top of frame. I-beam is welded to steel pad on conduit. U-bolts through exterior wall hold pedestal securely in position.

sections of 8-inch I-beam welded together to form a pattern as shown in the accompanying drawing. The three large sections or "stalls" each provide a storage space of approximately 54 sq. ft. (12' x 4½') and accommodate nine reels. Each of the four smaller stalls (32" x 40") at the base of the inclined rack holds one large reel.

Trunnions made of ½-inch thick steel and welded to the frame support the reel rods. Steel stop blocks on the end beams keep the rods from slipping out of the saddles. Double trunnions without stop blocks are welded to the inside beams forming partitions.

An overhead bridge-type hoist is used to load and unload the rack. Went's warehouse personnel find this payout rack speeds up cable handling; takes the drudgery out of the chore; provides additional storage space under the frame.

PLANNING AERIAL CIRCUITS?...

CIRCUITS TO BE BURIED DIRECTLY IN EARTH?...

CIRCUITS TO BE INSTALLED IN DUCTS OR CONDUIT?



• Here's one cable for all three services
THAT SAVES and SAVES and SAVES!!

SAVES ON FIRST COST. Simplex-ANHYDREX Cables save you money at the outset for their moisture-resisting Anhydrex insulation and their tough neoprene jacket combine to eliminate the need for costly metallic sheaths or other protective coverings. They save you the expense of buying and stocking a variety of cables for different applications as they are designed for use — as is — in open air, in the earth, and in ducts or conduit. They are Type RR Cables. They have CAA approval as underground cables for airport lighting under Specification L-824. They are suited for use as underground service entrance cables and when requested bear Underwriters' Type USE labels. You'll find them ideal, too, for street and park lighting, as Drive-In-Theatre Cable, and in signal and control circuits.

SAVES ON INSTALLATION. The comparatively light weight and small diameter of ANHYDREX Cables, their flexibility, and their smooth jacket surface result in worthwhile savings on installation. Crews work faster, more efficiently, for they find ANHYDREX Cables easy to handle, easy to splice, joint and terminate. When pulling the cable through ducts no oil or grease lubricants are needed. Marks, letters, or figures may be molded onto the jacket to provide instant identification of circuits.

SAVES ON MAINTENANCE. Simplex-ANHYDREX Cables promise long, dependable service, free of untimely failures and costly maintenance. Their Anhydrex insulation has excellent dielectric properties and provides steadfast resistance to water and moisture. The neoprene jacket is resistant to abrasion, soil acids and alkalis, oil, flame, sunlight and weathering. Having no metallic coverings, the cables are not subject to electrolysis nor harmed by vibration, stray or secondary currents.

SIMPLEX-ANHYDREX

SIMPLEX WIRE & CABLE CO.

79 SIDNEY STREET

Cambridge 39, Massachusetts



- 1 High Insulating Qualities
- 2 Greater Adhesion . . . Tighter Grip
- 3 Lasting High Tensile Strength
- 4 No Ravelling or Unsightly Edges . . . Goes on Without Wrinkling
- 5 Remains Usable Longer Than Other Brands
- 6 Won't Dry Out or Lose Adhesiveness

GET IT AT ALL GOOD ELECTRICAL SUPPLY STORES AND JOBBERS

In Splicing Compound, too...insist on Bull Dog Brand

BULL DOG SPLICING COMPOUND . . . time-proven as a worthy running mate to famous BULL DOG FRICTION TAPE . . . gives top assurance for high resistance to electricity. Self-vulcanizing into a solid, watertight joint. When you place your next order for BULL DOG FRICTION TAPE, be sure to stock up on BULL DOG SPLICING COMPOUND!



**BOSTON WOVEN HOSE
& RUBBER CO.**

Distributors in all Principal Cities

Plant: Cambridge, Mass. - P. O. Box 1071, Boston 3, Mass., U. S. A.

SILICONE REWIND COSTS

[FROM PAGE 49]

profit on motors rewound with Class H insulation is $1\frac{1}{2}$ to 2 times the gross profit realized on the Class A motors. The prices used for these examples are not necessarily the prices that would actually be charged, for material and labor costs are subject to local variations. However, the relation between Class A and Class H costs and profits are generally applicable.

Premium prices for this class of insulation are definitely justified. Increased life makes this the least expensive insulation available for hard working motors. Higher production, resulting from motors having 10 times the service life of Class B equipment, is worth many times the cost of any rewind job.

These advantages are illustrated by customers' experiences. For example, one manufacturer of automotive parts employs 5 hp. motors operating at 3600 rpm., starting and stopping them by applying dc to the windings, 105 times per hour.

In this service, Class A insulation lasted less than 6 weeks; Class H lasted more than 6 months.

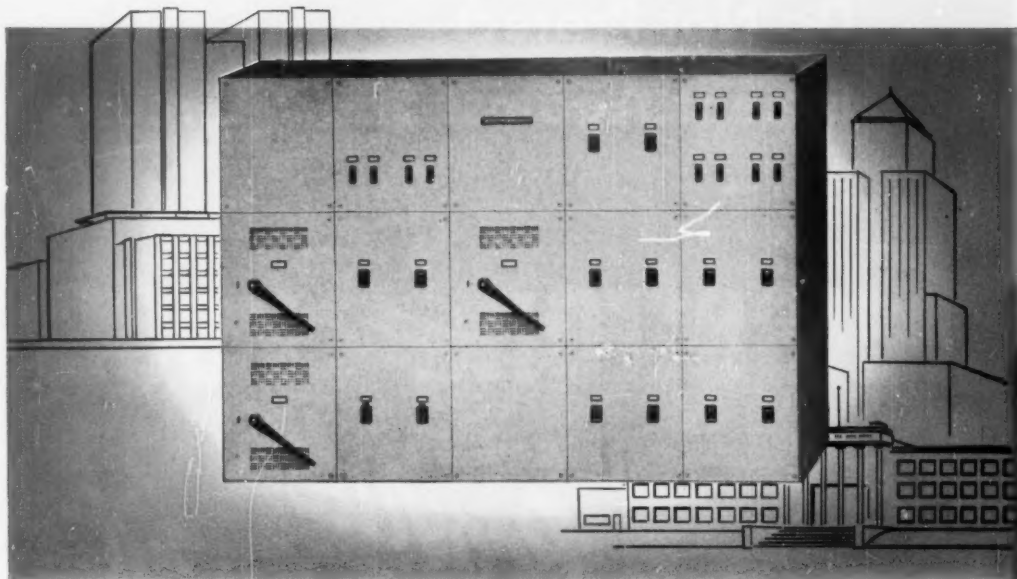
Rewinding motors with silicone insulation will also increase horsepower. For example: ten 50 hp., 900 rpm. motors were recently rewound with Class H insulation to deliver 75 hp.; eight 60 hp., 1200 rpm. motors were rewound to deliver 85 hp., and twenty 2 hp. motors were silicone insulated to give them a capacity of almost 3 hp.

All of these motors were in services where the starting torque was not great but where the running load required most of the additional horsepower capacity. The 50 hp. motors were about 12 years old and their original cost had already been written off.

The difference between the cost of rewinding the ten 50 hp. motors and the cost of new 75 hp. motors amounted to nearly \$15,000. We therefore saved this customer \$15,000 in cost of equipment alone. That does not take into account the cost of changing the circuits and installations to accommodate new 75 hp. motors. Savings on the other motors were in the same order.

Of course, salesmanship is required, but this salesmanship is a service to the customers, for introducing new and better ways to help solve problems is a positive service for them—and, in the long run, for the service organization.

YOU CAN BE **SURE**.. IF IT'S
Westinghouse



New **STANDARDIZED** Building-type Switchboards

Cut Planning Time

Switchboard planning for offices and other commercial-type buildings is greatly simplified with the NEW Westinghouse *Standardized Building-type* Switchboard.

Unitized construction eliminates special design problems . . . yet their complete flexibility gives you all the advantages of "custom built" units.

Factory-assembled, wired and tested, they may be shipped as a single unit and quickly placed in service. However, if desired, they can be shipped as individual units and quickly reassembled on the job.

They are specifically designed to feature low-cost circuit breaker protection by means of Westinghouse nofuse "De-ion" type AB circuit

breakers for ratings through 600 amperes. For ratings above 600 amps, Westinghouse type DA breakers are used. Get the complete story. Call your nearest Westinghouse office or write for D. B. 30-990, Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-40380



Westinghouse

SWITCHBOARDS

With rare exceptions on commercial and industrial installations

Ordinary Fuses and Breakers
Do Not Protect
Except Against Short-Circuits
But—

Fusetron Fuses

DUAL-
ELEMENT

Provide
10 Point
Protection

What is the FUSETRON Dual-Element FUSE?

A fuse link combined with a thermal cutout — the result, a fuse with tremendous time-lag and much less electrical resistance.

They have the same degree of Underwriters' Laboratories approval for both motor-running and circuit protection as the most expensive devices made.

Made to the same dimensions as ordinary fuses, FUSETRON Fuses fit all standard fuse holders.

Obtainable in all sizes from $\frac{1}{16}$ to 600 ampere, both 250 and 600 volt types. Also in plug types for 125 volt circuits.

Their cost is surprisingly low.

(FUSETRON is a trade mark of the Bussmann Mfg. Co., Division of McGraw Electric Co.)



Count 'em

- 1* Protect against short-circuits.
- 2 Protect against needless blows caused by harmless overloads.
- 3 Protect against needless blows caused by excessive heating — lesser resistance results in much cooler operation.
- 4 Provide thermal protection — for panels and switches against damage from heating due to poor contact.
- 5 Protect motors against burnout from overloading.
- 6 Protect motors against burnout due to single phasing.
- 7 Give **DOUBLE** burnout protection to large motors — without extra cost.
- 8 Make protection of small motors simple and inexpensive.
- 9 Protect against waste of space and money — permit use of proper size switches and panels.
- 10 Protect coils, transformers and solenoids against burnout.

* Fusetron Fuses have high interrupting capacity as shown by tests of the Electrical Testing Laboratories of New York City in December 1947.

FUSETRON

TRUSTWORTHY NAMES IN
ELECTRICAL PROTECTION

BUSS

DON'T RISK LOSSES

One **needless** shutdown — one **lost** motor — one **destroyed** switch or panel — one **burned out** solenoid — may cost you **far more** than replacing every ordinary fuse with a **FUSETRON** dual-element fuse.

Mail the coupon now for complete information about the All-Purpose Protection of **FUSETRON** Dual-Element FUSES.

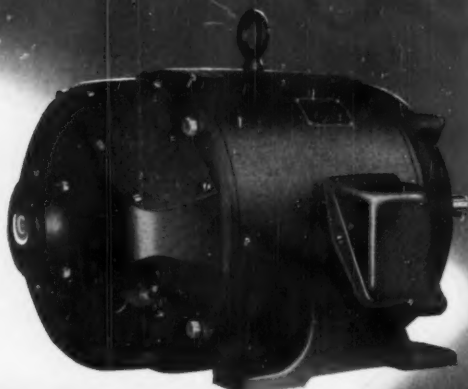
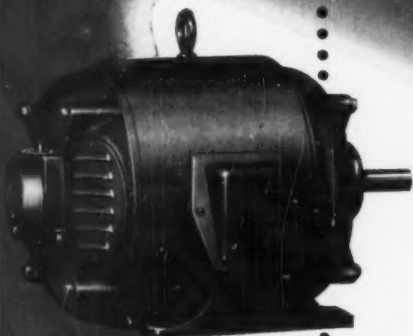
Bussmann Mfg. Co., University at Jefferson
St. Louis 7, Mo. (Division McGraw Electric Co.)
Please send me complete facts about **FUSETRON**
Dual-Element FUSES.

Name _____
Title _____
Company _____
Address _____
City _____ State _____

ECM1289



To Start Heavy Loads -
With Low Starting Current



.. Use *Century* Type RS
Single Phase Brush Lifting Motors

Century Type RS, repulsion start, induction, single phase brush lifting motors are ideal for installation on reciprocating pumps, compressors and other hard-to-start equipment.

They provide the power to start under load—even in very cold weather—without overmotoring the driven machine.

Repulsion start motors provide greater starting torque per ampere of current than any other type of single phase motor—consequently the least disturbance to line voltage—an advantage on long or small capacity transmission lines.

They are widely used in the rural areas which usually have only single phase energy.

Many power companies are recommending the use of single phase motors up to 7½ HP, in residential districts of the larger cities, because polyphase energy is not always available.

Century Type RS brush lifting motors are built in sizes from ½ to 20 HP.

Century builds a wide range of types of motors from 1/6 to 400 horsepower for all the popular electric power applications.

Specify Century motors for all your electric power requirements.

Popular types and standard ratings are available from factory and branch office stocks

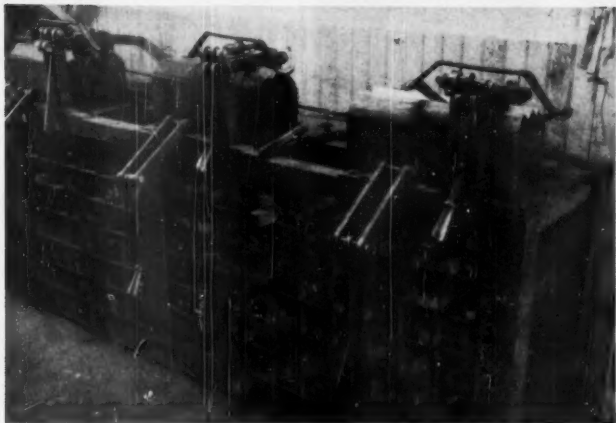


CENTURY ELECTRIC COMPANY - 1808 Pine St., St. Louis 3, Missouri

Offices and Stock Points in Principal Cities

CE-628

Motor Shops



HOT AND COLD coil press unit in the Giles Armature and Electric Works, Inc., shop. Press block on left is heated by strip heaters; the two blocks on right are cooled by refrigerated circulating water. Hot press softens insulation; cold press sets it into solid homogeneous mass. Result: thicker insulating jacket and easier slot insertion.

Hot and Cold Presses Smooth Coil Jackets

The best way to assure long-life performance when rewinding an electric motor is to put as much insulation as possible on the coils in such a manner that they will fit easily into the slots without fear of damage to the coil jacket. That is the repair philosophy of Giles Armature and Electric Works, Inc., Marion, Illinois. Being down in the coal mining section of the State, Giles has occasion to repair many heavy duty motors that get pretty tough usage; applies this philosophy to advance the reputation of his organization and increase customer satisfaction.

Giles makes numerous sets of coils to order for other motor repair shops, hence it is vitally important that these coils fit easily into the motor slots when other shops install them. To provide this extra insulation thickness and easy slot fit, the Giles brothers, William S. and John E., designed and built a combination hot and cold press table.

After the formed coil has been insulated, dipped and baked, it is placed in a hot press to soften the varnish and press the insulation into a solid homogeneous mass. The coil is then placed in a cold press where this soft insulation mass is set into a solid insulating jacket. All slot portions of the coils are painted with a paraffine and bee's wax mixture to prevent sticking to the press die and also to act as a lubricant

when coils are inserted in the motor slots. All coils under 2,200 volts are made full slot size; those over 2,200 volts have a margin of approximately 0.015 inch for feeder paper.

Heavy angle-iron forms the frame of the press table. On the top are mounted one hot press block (180° F. to 200° F.) heated by two 250-watt strip heaters; and two cold press blocks (about 60°F.) chilled by circulating refrigerated water. Each block has two cantilever-type clamps for long and short coils. The hand levers are so designed that, when in the down position, they lock the clamp arm securely in place. A back bolt adjustment permits the clamp arm to be raised or lowered to decrease or increase pressure on the coil.

A set of steel bar dies is used for each size of coil normally made in the Giles shop. Dies are made of 1½-inch key steel milled to accurate coil size dimensions. The top die has a ⅜-inch nut welded on its edge; is attached to the clamp arm by a ⅜-inch cap screw. The bottom die rests in the press block. Should any coils be pressed before the wrapped insulation is applied, filler strips are used in the dies.

The space under the press table is divided into approximately 112 pigeonholes for die storage. A similar storage unit on the opposite side of the

aisle is also used for additional dies. A wall chart, mounted above the presses, lists the identification number of each set of dies for each type and size of coil. This number is stamped on each die; also a descriptive legend designating type of coil and motor.

Two cold presses are used to save time and permit sequence operation on groups of coils. Coils are normally kept in the hot press from two to five seconds; in the cold press from 20 to 60 seconds depending upon coil size and press temperature.

Operating sequence is as follows: After proper size dies have been mounted in all three presses, one side of a coil is placed in the hot press for about five seconds. Then it is placed in No. 1 cold press. A second coil is placed in the hot press, then placed in cold press No. 2. The coil in No. 1 cold press is removed and its other side placed in the hot press; then it goes back to cold press No. 1 and after proper time it is removed and stacked on a table. In the interim, the other side of the coil in cold press No. 2 is placed in the hot press, then back into the cold press No. 2 again. A third coil is placed in the hot press and the sequence continued until all coils have been processed.

Drill Attachment Bands Coil Ends

Stator coil ends are usually connected by twisting the conductors, soldering and taping. In larger stators with rectangular copper in the coil turns, this operation is not so simple. Some method must be used to band the turns together before soldering. One method is to use specially formed copper clips which are then pressed on the coil ends. Another method is to band the coil ends with wire, then solder and insulate.

This latter scheme is used at the Industrial Electric Equipment Company shop in Dallas, Texas. To materially reduce the time required to make stator connections, co-partners J. C. Hardie and J. E. Hurt designed and built an electric drill attachment which speedily puts five to six turns of tightly wound copper wire on each coil connection.

The attachment consists of a steel spindle with a cone-shaped "nozzle" which fits over the coil ends. Directly

✓ POINT-BY-POINT
JOB EXPERIENCE
PROVES-



nothing tapes like
ACCURATE TAPES

Here's why!

FRICTION TAPE

- ✓ **PERFECT COHESION:** Accurate sticks tight, stays tight to the work — not to your fingers.
- ✓ **HIGH TENSILE:** Allows time-saving fast, tight wraps over the most irregular surfaces and splices. Stretches taut, stays taut permanently.
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- ✓ **MORE STRETCH:** Has the unequalled stretch of genuine live, virgin rubber for slim, space-saving coverage. Always of uniform width and thickness.
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- ✓ **PERFECT PIGTAILS:** The safest, fastest tape for covering pig-tails that was ever made. No fusing or pinching — no open ends.
- ✓ **DIELECTRIC STRENGTH:** The perfect insulation. Can't crack, peel or deteriorate. Superior aging quality is a time proven feature.

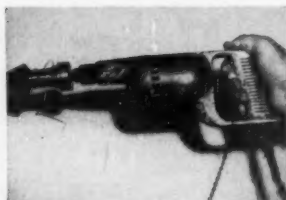
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All you need to know about tape in one handy brochure. Complete data and specifications including roll lengths and packaging. Write for your copy today. Just address ACCURATE MANUFACTURING COMPANY, GARFIELD, NEW JERSEY.



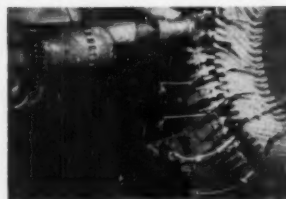
IF IT'S TAPE...IT WILL PAY YOU TO MAKE SURE

IT'S

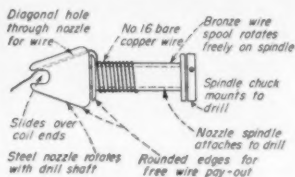
ACCURATE TAPE



COIL BANDING ATTACHMENT on a standard electric drill is used to reduce coil connection time at the Industrial Electric Equipment Company repair shop in Dallas.



BANDING COIL ENDS on large stator. Rotating nozzle backs off as it winds five to six turns of copper wire on coils. Here, jumpers between coils have already been clipped.



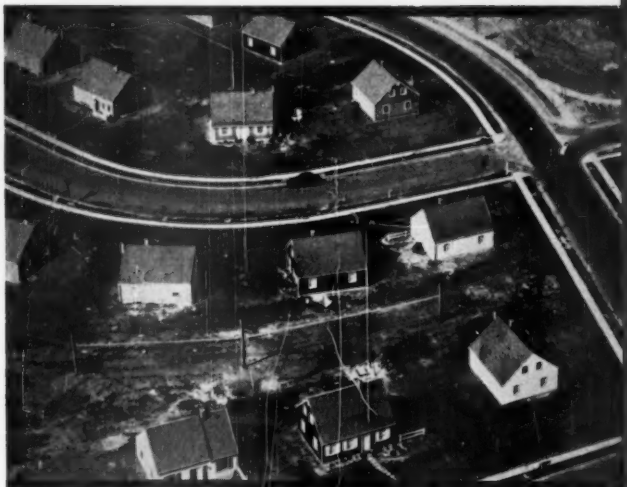
CROSS-SECTION of attachment showing basic design of spindle and wire spool.

behind the nozzle, and rotating freely on the spindle shaft, is a bronze spool with No. 16 bare copper wire. The wire is threaded through a diagonal hole drilled in the steel nozzle and emerges at the nozzle opening. As the spindle rotates with the drill shaft, the wire is payed-out through the nozzle and wound around the coil ends.

To operate the attachment, the mechanic places the nozzle over the skinned coil ends, holds the end of the copper wire firmly against the coil and presses the drill trigger switch. As the nozzle winds the five or six turns of wire on the coil end, the spindle backs off and the mechanic places the nozzle over the next connection. He repeats the operation until all coil ends are securely banded. Then, he clips the banding wire jumpers between coils; presses the cut ends down firmly with pliers and solders each connection.

A standard 3600 rpm., 1/4-inch electric drill is used in series with a rheostat to reduce spindle speed. While learning to use the attachment, mechanics usu-

FOR HIGHWAYS...



...OR HOMES

Neoprene-jacketed cable means economical, trouble-free service

Out in the open, neoprene-jacketed cable withstands sunlight, weather, ozone, heat and cold . . . resists chemical deterioration in industrial areas, oil and grease. It can stand scuffing and abrasion from trees; will not festoon. Underground, a tough, durable neoprene jacket offers protection against crushing and denting by settling earth. And it withstands the effects of acid and alkaline soil; or galvanic action, which is destructive to metal sheaths.

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...with the GREENLEE HYDRARAM Knockout Punch Driver

Here's the simplified, extra efficient way to enlarge knockouts, or cut entirely new openings, for conduit up to 4". Powerful, portable HYDRARAM for GREENLEE Knockout Punches develops over eleven tons of hydraulic pressure to drive Punches through 10-gauge metal in a jiffy. Operation is simple as A. B. C.—makes the job a snap. HYDRARAM set includes a Hand Hydraulic Pump, a High Pressure Hose and an Adapter with extra sleeve to accommodate all GREENLEE Knockout Punches for making holes for 1/4" up to 4" conduit. Attachments also available for 1/2" conduit Punches and GREENLEE Radio Chassis Punches. Set is packed in metal carrying case with compartment for Punches as illustrated. May be purchased with or without Punches. Write for literature. Greenlee Tool Co., 1752 Columbia Avenue, Rockford, Illinois.



OTHER GREENLEE TIMESAVING TOOLS FOR ELECTRICAL WORK
Hydraulic Conduit and Pipe Benders • Hand Benders • Joist Borers • Cable Pullers • And Many Other

ally operate the drill at a spindle speed of about 200 rpm. As they become more accustomed to the unit, they can adjust the rheostat and speed up the drill to meet their individual needs.

Time studies indicate that, depending upon the operator, from 30 to 60 minutes can be cut from connection time on a 25 hp., 900 rpm., stator. Time economies on other sizes and types of motors vary in proportion.

Table Dollies For Motor Rewinding

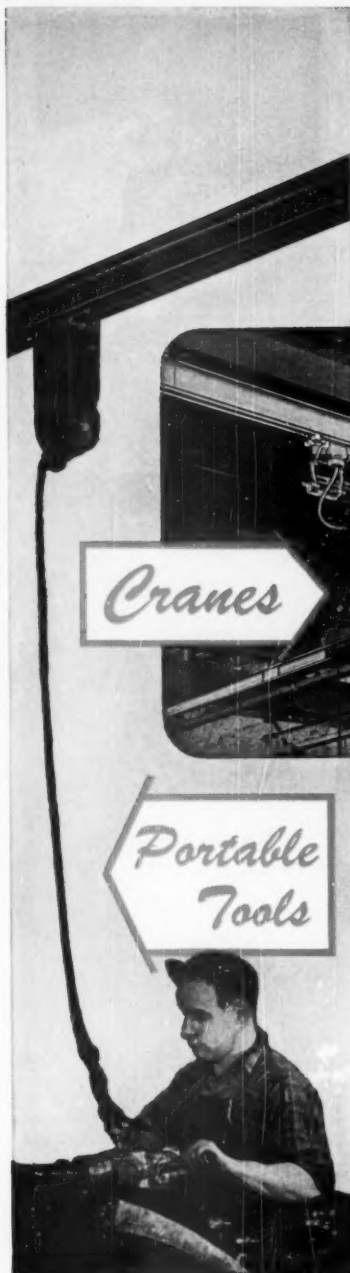
Straight-line production techniques, of one form or another, are being used more frequently in motor repair shops in an effort to reduce rewinding time. Some shops use roller conveyors with work stations spotted on either side; others use long work tables with various methods of moving the work from one mechanic to another. Invariably, the technique employed depends upon the shop layout, type of equipment repaired and the number of motors of identical size that may come into a shop at a time.

One method, developed by the Lima Armature Works, Inc., Lima, Ohio, uses a series of table dollies to move the motor frame from one rewind station to the next. The special winding table is 30 feet long, 41 inches wide, 34 inches high and is constructed of 3-inch channel iron frame with a wood work surface. Mounted along one side of the table top are two 20-foot lengths of 1-inch channel iron (on 6-inch centers) to form the track for the table dollies.

Several metal dollies are used. Each is constructed of a 15-inch diameter steel plate (1/4-inch thick); has four



TABLE DOLLIES ride channel-iron track on this special motor winding table. Motor progresses from right end of table where coils are inserted through various stations to left end where unit is removed for dip and bake.



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Cranes

*Portable
Tools*



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Shut-downs due to faulty wiring and connectors disappear when the totally enclosed Electric Feedrail Distribution System is installed. You don't have to wait even for rewiring when you relocate electrical equipment in your plant.

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A Geared Pipe Threader

THAT'S EASY TO

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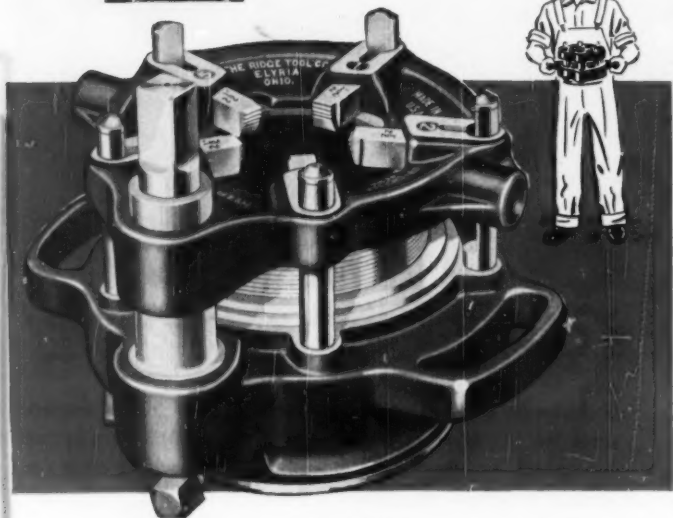
"These big solid handles make it a cinch to lift and carry the RIGID 4P"



COILS ARE INSERTED in stator at right end of table.



LAST STEP before motor is removed for dip and bake is the fusing of coil connections (with torch) and attachment of lead wires. Formvar magnet wire is generally used.



RIGID No. 4P cuts perfect threads on 2 1/2" to 4" pipe

❶ No matter how good a threader is, it's a lot better if it's easy to handle. RIGID 4P has balanced loop handles so you can easily pick it up and put it on pipe—even when it's greasy and you're tired. Mistake proof workholder sets to size *before* you put it on pipe, one screw to tighten, no bushings. 4 sets of 5 high-speed steel chaser dies give clean accurate threads on 2 1/2," 3," 3 1/2" and 4" pipe. Ratchet handle furnished—RIGID Universal Drive Shaft and Power Drive available for power-threading. For perfect threads, easily, order the RIGID 4P from your Supply House.

2-inch diameter ball bearing "wheels" which ride in the channel tracks.

After the newly wound coils leave the winding head, they are stacked at the right hand end of the winding table where they are inserted into the stator slots. The stator is then placed on one of the dollies and moved down to the next position where the connections are made. It then proceeds down the table where the connections are fused together with an acetylene torch and the lead wires attached. The unit is then passed on to the end of the table where it is removed for a dipping and baking operation. Stators up to 20 hp, 1800 rpm size are wound on this table. By reducing non-productive labor, associated with shifting work, overhead charges are minimized.

The system proves most efficient when a number of motors of a similar rating are rewound as a group. On an average 5 hp motor, the overall winding time can be reduced as much as 1 1/2 hours when motors are handled in lots of 10 or 12 units.

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THE RIDGE TOOL CO. • ELYRIA, OHIO

The 60-second gold mine!

60 SECONDS MAKE A MINUTE . . . minutes run into hours and into *money* before you know it! And that's why Gedney Fittings are the best buy obtainable today. Gedney Fittings are machined with absolute accuracy. They'll save you the minutes that can add up to hundreds of dollars of a workman's time—each year!



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- ★ Accurate castings of malleable iron . . . no breakage.
- ★ Threads cut true . . . perfect conduit alignment.
- ★ Designed to fit . . . vibration cannot work it loose.



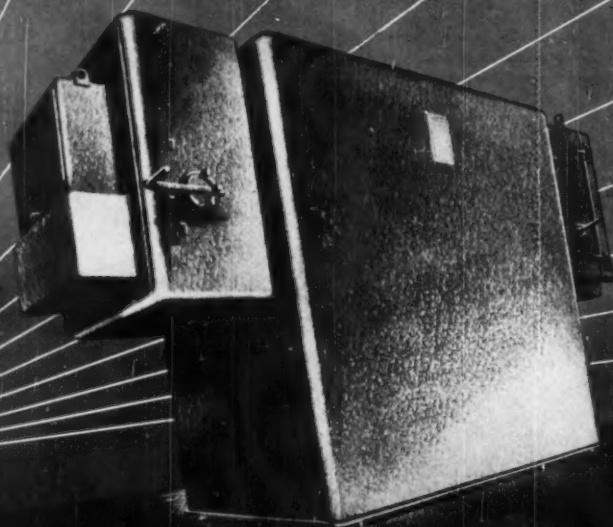
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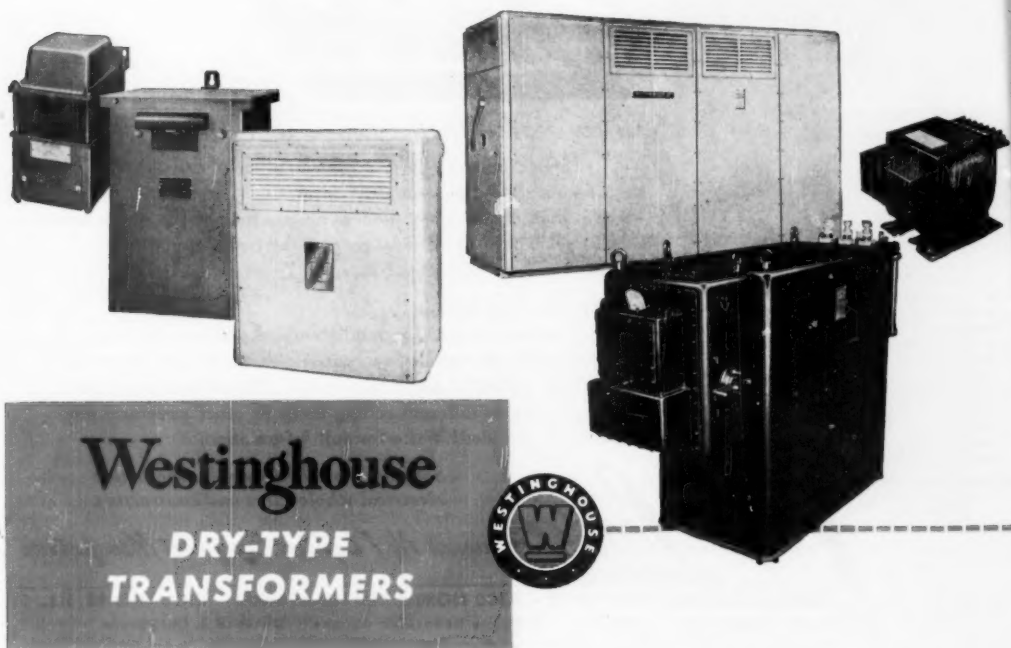
It's just off the press. "The Safest Transformer Ever Built" is a fully illustrated booklet on Westinghouse Dry-Type Transformers.

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J-70574



CEILING of LIGHT
Solves
"Old Ceiling" Problem



Leaderall moulded plastic unit ceiling at Electric Supply Corp., Chicago. Approximate area 6,000 sq. ft. Average intensity 50 foot candles . . . light intensities may be varied, however, without visual effect. Indicated framed area of 4 sq. ft. Light source is simple, fluorescent strip with reflectors. Architect . . . Mr. Vic Charn.



An ideal Leaderall installation would consist of fluorescent slimline strip with reflector mounted to ceiling, plus Leaderall plastic ceiling grille installed below. Leaderall grille is easily removable for quick relamping. Grilles provide more apertures per foot for maximum "sifting" of lamp rays and greatest shielding of lamps. Units with 40" - 40" cut-off available in 2' x 4' or 4' x 4' sections. Other sizes and curvatures custom made. Plastic is destatized . . . dust resistant. No interference with sprinkler system or air conditioning.

Leaderall

Illuminated Ceilings ... Modernize, Beautify

Spreading a soft glow of even light from wall to wall, Leaderall ceilings simplify decorative planning two ways: They add a cool, quiet modern note to the completed decorative scheme! They cut remodeling costs by permitting old ceilings to be used without change!

EASY TO INSTALL —

Section after section of Leaderall moulded plastic units are hung on adjustable tie rods at any desired distance from present ceilings. New ceiling is absolutely even . . . All reconstruction costs normally due to different ceiling levels or other structural difficulties are avoided! Write for full information.

Sold and installed only by the better electrical wholesalers and contractors

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Modern Lighting



JEWELRY STORE is primarily illuminated by lens ceiling-mounted units equipped with both incandescent and fluorescent lamps. Wall cases are lighted by inbuilt fluorescent strips above the upper valances. Lighting levels of over 100 footcandles are obtained.

Holophane Lenses For Jewelry Store

The Claude S. Bennett jewelry store in Atlanta, Georgia, is an example of lens lighting variations for the effective use of both incandescent and fluorescent lamps. The store is divided into four main areas: the sidewalk display and recessed entrance, the front interior area where diamonds and watches are displayed in floor cases, the main section where glassware, silver and jewelry is exhibited, and an office and utility area in the rear beneath a glass-enclosed balcony office.

Two or more lighting techniques are used in each area. For example; exterior show windows are top lighted by reflector flood lamps recessed above circular louvered panels, while a 25-mm cold cathode perimeter cove lights the entrance area extending to the main entrance from the sidewalk.

The front interior area, measuring 18 feet in length, 19 feet in width and 13.5 feet in height, is illuminated by four flush-mounted 3-lamp 40-watt fluorescent fixtures equipped with glass control lens, and eight 300-watt incandescent counter lights with control lenses. Footcandle intensities with fluorescent only are approximately 50 footcandles and, with counter lights only, the intensity is 90 footcandles. Fluorescent lamps are 4500-degree white. Wall cases are illuminated from

above by in-built 40-watt fluorescent strips.

The rear display area is somewhat larger, measuring 50 by 19 by 16 feet for length, width and height. Illumination is provided by 18 surface-mounted 4-lamp 40-watt 4500-degree white fluorescent fixtures and 22 incandescent counter lights of the 300-watt size. As in the front area, control lenses are combined with all fixtures. With fluorescent on, intensities are 80 footcandles and, with incandescents only, intensities are 70 footcandles. All interior units were manufactured by the Holophane Company.

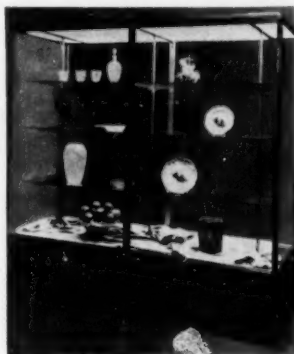
It will be noted in the photograph that ceiling units are so positioned that reflections always move away from the eyes of customers, that is, reflections from front counters are directed towards the walls.

The store, painted with light buff ceilings and pale green walls and furnished with light birch wall cases having a reflection factor of 35 percent, was designed by Boyce W. Pearson, architect. T. Taylor Peake of the Georgia Power Company engineered the illumination plan which was installed by electrical contractors Brooks-Allison of Atlanta.

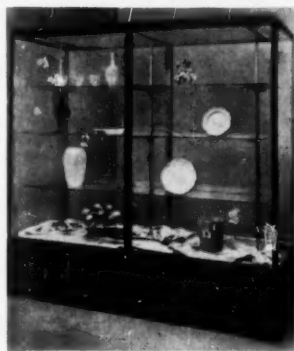
Flexible circuiting and control makes it possible to illuminate all local areas separately, using incandescent or fluorescent either alone or conjunctionally.

Diffuse Lighting For Museum Display Cases

The development of what is termed "fluid lighting" has provided a long-needed medium for more effectively presenting the details of objects displayed in high museum cases. Introduced by the Library Bureau of Remington Rand and resulting from several years of research and experimentation, the new system provides strong, shadowless illumination at all levels within the case. The term "fluid lighting" literally describes the action of the overhead illumination, for objects



FLUID LIGHT illuminates objects on display in case developed by the Library Bureau of Remington Rand. Luster, brilliance, contour and color is at a maximum under intensities of from 87 to 26.5 footcandles.



WITH CASE LIGHTING OFF, displays are flat and lifeless. Intensities on the shelves range from 35 down to 12 footcandles, although exterior lighting delivers 99 footcandles to the top of the case.

Stop costly socket replacement!

NEW

Levolier MODEL 4100 INDUSTRIAL SOCKETS

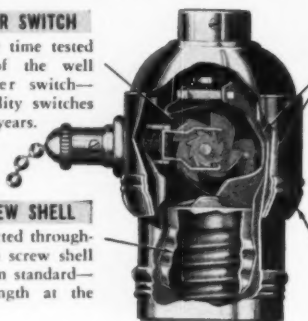
with the proven mechanism of the *Levolier* switch



Constructed to outlast any socket you've ever used. The new Levolver 4100 Series Industrial Sockets are built with extras throughout . . . extras that eliminate the trouble spots found in ordinary sockets. **Just check these features:**

USES LEVOLIER SWITCH

Incorporates the time tested mechanism of the well known Levolver switch—ultimate in quality switches for over thirty years.



HEAVIER SCREW SHELL

Heavily constructed throughout with bronze screw shell .006 heavier than standard—for added strength at the lamp base.

DOUBLE WALL THICKNESS

Cap and casing overlaps resulting in double wall thickness support for the lever. Eliminates cap and casing separation with actuating pull.

CAP AND CASING LOCK

Threaded collar that locks cap and casing together cannot pass over shade threads to get lost when socket is disassembled for wiring.



Model 41 LEVOLIER SWITCH Here is the switch that is now unconditionally guaranteed when used in lighting circuits. Levolver Model 41, 6 amp. "T" rated 125 volt switch is Underwriters' Inspected. Especially suited to fixture canopies and fractional horse power motors. Only $\frac{5}{8}$ " thick. Brass, dark bronze or burnished nickel finish.

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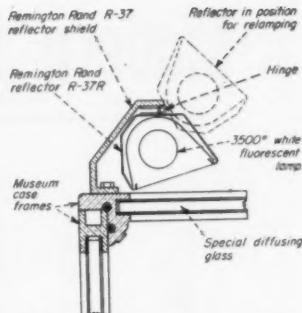
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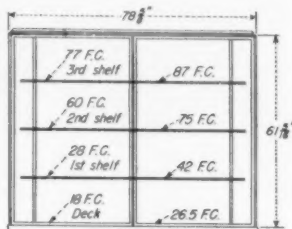
McGILL

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ONLY McGILL MAKES Levolver SWITCHES



DETAIL OF CASE TOP indicates method of attaching reflector to ornamental cornice. Reflector swings inward and upward to clean or replace the 3500-degree white fluorescent lamps used on the four sides.



Readings in this panel were taken with the shelves loaded with opaque objects

Readings in this panel, as shown in photograph

LIGHTING INTENSITIES range from 87 to 26.5 footcandles when objects are positioned as shown in the photographs. When shelves are crowded with opaque objects, levels are in the range of 77 to 18 footcandles.

are presented with a clarity and true-ness of color that suggests all-directional flowing light.

In construction, the case is provided with clear glass shelves and a special diffusing glass top above which fluorescent lamps are mounted on all four sides in asymmetric reflectors that direct the light downwards and inwards towards the center of the case. Reflectors are hinged so that they may be rotated inward and upward for relamping. Lamps are 3500-degree white.

With case lighting in operation, illumination intensities of 87, 75, 42 and 26.5 footcandles are recorded on the various shelves. Even with shelves crowded with opaque objects, light readings are 77, 60, 28 and 18 footcandles on the four display levels. With high levels of illumination within the case, reflections due to outside light sources are eliminated.

The effectiveness of the new case lighting is dramatically illustrated by referring to the illustrations showing "on" and "off" conditions.

Coming soon!

CROUSE-HINDS

SAFETY

2-Wire, 3-Pole

**Grounding
Plug Receptacle**

for

OBROUND CONDULETS

**It gives you a positive
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- ① A duplex receptacle designed in accordance with the new standards established by NEMA and approved by ASA.
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- ③ The receptacle takes the new plug caps with two parallel blades and one "U" - shaped contact. It also takes the standard two blade parallel non-polarized and two blade parallel polarized plug caps.

This safety grounding plug receptacle for Obround CONDULETS is one of the thousands of items in the complete CONDULET line. Use sturdy cast Feroloy CONDULETS and rigid conduit on every installation.



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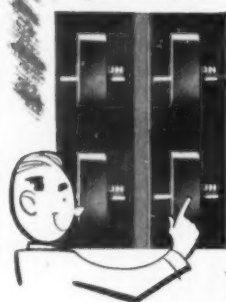


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New convenience for customers
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Push—it's ON!
Push—it's OFF!
Push—it's ON
again!

^{*}Push-button switch with automatic protection for electric circuits

NOTHING could be simpler! A simple push of the finger switches the current either ON or OFF. If Pushmatic is automatically tripped by short or overload, just push and service is restored. No bothersome resetting by hand... no fuses to buy. And simple push-button switching is just one of the many exclusives that make Pushmatic Electri-Centers first for circuit control and protection. Pushmatics offer flexibility never before obtainable in any panelboard!

All units interchangeable!

All Pushmatics are identical in size and contour, regardless of rating or type. That means each unit

can be quickly inserted, removed or interchanged without disturbing other units. Handle ties quickly convert two horizontally adjacent single-pole Pushmatics into two-pole branches.

Surest protection is another Pushmatic feature. Approved by Underwriters' Laboratories, quick-break Pushmatics operate with split-second precision when short or overload occurs. Automatic tripping is entirely independent of manual operation.

There's a Pushmatic to meet every load condition: THERMAL-MAGNETIC, or THERMAL-MAGNETIC with *exclusive AMBIENT COMPENSATING FEATURES*. They're rated at 15, 20, 30, 40 and 50 amperes, 1 pole, 120 V., or 2 poles, 120-240 V., AC.

For simplest switching, most flexibility, surest protection and fastest delivery, change to Pushmatic Electri-Centers for every panelboard job!

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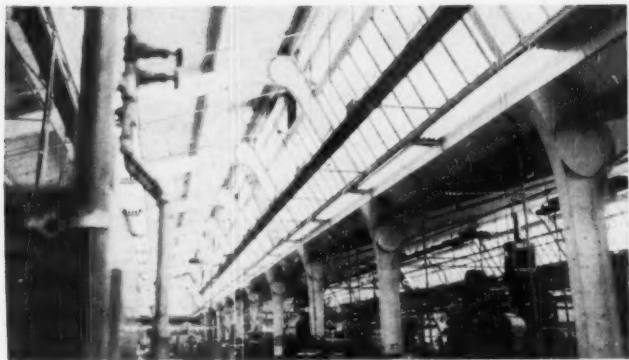


1 Here's insurance for rush jobs! You're prepared for any order with a small supply of basic Electri-Centers and fronts plus...

2 several cartons of flexible, interchangeable Pushmatics, supplied by your local distributor. Here's how this small investment pays off:

3 When you have a hurry-up job, simply pick out the basic Electri-Center needed, hook Pushmatics on the mounting rib and connect them to bus bars with a screw driver.

4 No time wasted tracking down supplies! When time counts, you're prepared for any panelboard job with this small supply of flexible Pushmatic Electri-Centers!



CONTINUOUS COLD CATHODE runs on 10-foot centers provide 45 foot-candles to working areas in manufacturing areas of McCullough Motor Corp.

Cold Cathode For Motor Manufacture

Four-lamp industrial type fixtures, mounted in continuous rows on 10-foot centers, provide 45 footcandles of lighting intensity to production areas in the factory section of the McCullough Motor Corporation, Los Angeles, California. Cold cathode lamps operate at 120 milliamps. Mounting height is 11 feet above the working floor. Used during daylight working hours in combination with natural illumination

coming into the plant through large glass panels in the saw-tooth roof, these fixtures provide a color-blended high-intensity environment for manufacturing processes. In the 48,000-sq-ft plant, 1000 fixtures are installed, involving 4000 lamps. Of this total, 600 units are installed in the manufacturing area; the remainder in the plant areas occupied by the office and engineering departments.

Indirect Lighting For Classrooms

Classrooms in the Lakewood School, Long Beach, California, are lighted by six suspended incandescent fixtures containing 500-watt silvered bowl lamps. With three concentric collars to eliminate source brightness, lighting is totally indirect, primarily reflected from the acoustical tiled ceiling slanting downwards from the window side

from a 12- to an 11-foot height. With artificial illumination only, light levels on desk surfaces are 18 footcandles but, augmented by natural light during average classroom hours, illumination varies from over 100- to slightly over 30-footcandles. Ceiling tiles are flat white; upper side walls are light chrome yellow.



SIX FIXTURES housing 500-watt silvered bowl incandescent lamps are installed in this 24- by 33-foot classroom in the Lakewood School, Long Beach, California.

**This Steam-Heated Plant
Uses 18 AUXILIARY
ELECTROMODE
All-Electric HEATERS**



Plant of Commercial Controls Corporation, Rochester, N. Y.

ELECTROMODE All-Electric Heaters are the economical answer to heating problems in old and new plants throughout the country. In the plant shown above, use of thermostatically controlled Electromodes supplied fan-circulated warmth to eighteen hard-to-heat areas, saved piping and eliminated expensive enlargement or forced operation of the central steam system. Here is how it was done:



FACTORY—Underheated areas were eliminated with eight suspension-type Electromodes.



GENERAL OFFICES—A cold north side was heated perfectly with five 5 KW units.



SHIPPING ROOM—Drafts from platform were counteracted with two 5 KW Electromodes.



GUARDHOUSE—This always-cold building was made comfortable with one 1.5 KW portable.



WASHROOM—Added warmth for showering comfort was provided by one 3 KW Unit.



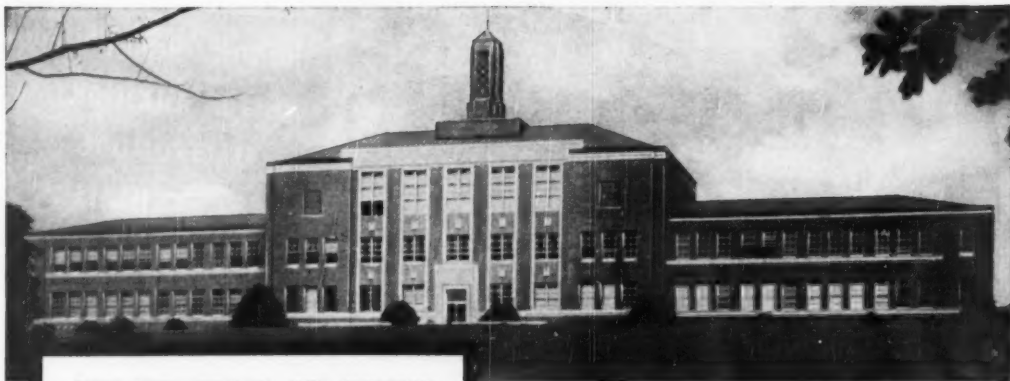
LOBBY—One 4 KW wall type Electromode overcame poor heating caused by long steam runs.

**AUTOMATIC AND NON-AUTOMATIC
ELECTROMODES (1.5 TO 45 KW)
FOR HOME, OFFICE, INDUSTRY
SEND COUPON TODAY!**

ELECTROMODE CORPORATION
45 Crouch St., Rochester 3, N. Y. Dept. EC-120
Please send catalogs and full technical information concerning Electromode All-Electric Heaters.

NAME _____
ADDRESS _____

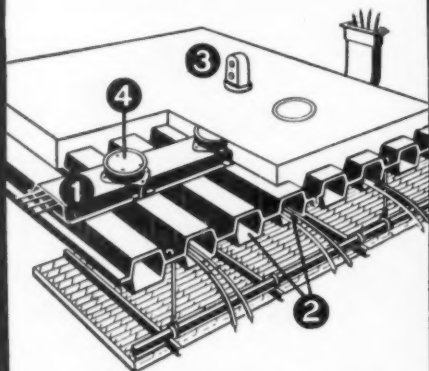
*World's Leading Exclusive Manufacturers
of All-Electric Heaters*



NEW SHENANDOAH LIFE BUILDING

*Assured
of electrical
adequacy*

**with GENERAL ELECTRIC
Q-FLOOR WIRING**



Cutaway drawing shows simplicity and flexibility of G-E Q-Floor wiring system. (1) Header duct—at right angles to Q-Floor—carries wire from load center to cells. (2) Cells serve as raceways for power, signal, and telephone systems. (3) Floor outlets are installed by tapping Q-Floor cells at any point. (4) Junction units in header duct permit easy access to wiring at any time.

The new home office of the Shenandoah Life Insurance Co., Roanoke, Virginia. Constructed along modernized Georgian lines, it represents a combination of architectural beauty with functional design. More than 40,000 square feet of Q-Floor duct throughout the building provides for future electrical expansion.

Architects: Smithy and Baynton, Roanoke, Va.

General Contractors: B. F. Parrott and Co., Inc., Roanoke, Va.

Consulting Engineers: William A. Brown, Washington, D. C.


Electrical Contractors: Richardson-Wayland Electrical Corporation, Roanoke, Va.

Typical of the foresight and long-range planning evidenced by today's insurance companies is this recently completed, modern home office of the Shenandoah Life Insurance Co., Roanoke, Virginia.

During the building's planning stage, two important factors were emphasized: 1. The necessity of designing a structure that could keep pace with the projected growth of the company. 2. The desire to assure continuing operating efficiency through the utilization of modern business equipment.

It was natural, with these considerations in mind, that a comprehensive G-E Q-Floor wiring system be installed. This built-in raceway system will provide 100 per-cent electrical availability throughout the entire building . . . for the entire life of the building.

Investigate G-E Q-Floor wiring *yourself*—you'll be amazed at the versatility it provides. For complete information on Q-Floor wiring, contact any General Electric Construction Materials general office—or write for a copy of the Q-Floor Wiring Data Manual, Section C6-1218, Construction Materials Department, General Electric Company, Bridgeport 2, Connecticut.

You can put your confidence in—
GENERAL  ELECTRIC

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We suggest that you tear out the bottom card before you start reading the following pages. Keep the card handy. You might even use it as a book mark in case you are unable to complete reading the following pages at one sitting. Then, as you see some new products about which you want to know more, just circle on this card the number which appears at the top of the item describing the new product or catalog. Circle each number on this card which corresponds to the number on the item in which you are interested.

If you want to know more about something which is advertised in this issue, put the number of the page on which the advertisement appears in one of the squares at the bottom of the card. If you want further information on the product advertised on page 16, for example, just put a 16 in one of the squares. When more than one advertisement appears on a single page, include the manufacturer's initials together with the page number (16-A&B)

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The Editor,
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330 West 42nd St.
New York 18, N. Y.

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330 W. 42nd St., New York 18, N. Y.

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after February 1st

Please send me without obligation, the new product information or catalogs described on the following pages and identified by numbers circled below.

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41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77			

Advertising
on page . . .

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COMPANY

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CITY STATE 12/80

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Electrical Construction and Maintenance is written for you by a large staff of editors and consultants, each an authority on some phase of the business. They will be glad to give you expert advice and answers to your questions.

other problems? turn the page for the answer.

Dear Editor:

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COMPANY
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CITY STATE

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Reader Service Department
ELECTRICAL CONSTRUCTION AND MAINTENANCE
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New York 18, N. Y.

USE THIS CARD TO ASK THEM!

Do you have a problem in wiring layout, motor control, lighting technique?

Ask the editors.

Do you want advice on cost analysis, billing procedures, market conditions, or government regulations?

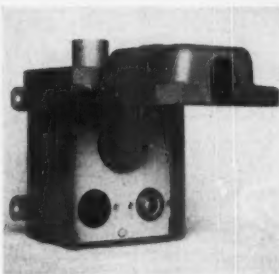
Ask the editors.

Do you have a gripe? Want to read more articles on some subject? Want to ask a question about some article you read in this issue?

Use the card.

To secure further information on new product or new catalog and bulletin items listed elsewhere in this section, use the card on the other side.

Product News

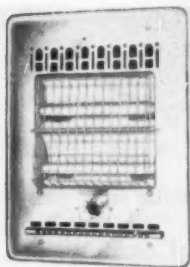


Power Outlet

(1)

Announcement has been made of new utility power outlets. They are made of heavy gauge galvanealed steel and finished in gray enamel. Cover is formed and slotted at bottom, making unit weatherproof and permitting door to be closed w/en cord and cap are plugged into receptacle. P-10 and P-20 units have a $\frac{1}{2}$ inch hub in top and a $\frac{1}{2}$ inch knockout in bottom. P-50 units have a 1 inch hub in top and $\frac{1}{2}$ inch knockout. P-50-10 has a 10 ampere 2 wire receptacle which is fused in addition to the 50 ampere 3 wire receptacle. Approved by Underwriters Laboratories.

Midwest Electric Products, Inc.,
Mankato, Minn.



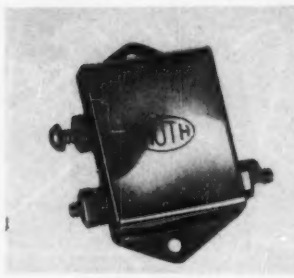
Wall Heaters

(2)

Wall insert radiant Heetaires of 1000 to 1250 watts with built-in thermostats have been announced. With the thermostatic control these wall heaters automatically produce and maintain any desired temperature between 40° F and 85° F. A feature of these units is that the cans (or boxes) are packed separately and may be ordered in advance of the rest of the Heetaires so that they can be installed when the roughing work is in progress

and the Heetaires attached when the finishing is done. Model 241T, 1000 watts, produces 3412 Btu/hr.; model 246T, 1250 watts, with two elements produces 4265 Btu/hr. Both models are finished in Nuchrome or ivory enamel.

Markel Electric Products, Inc., and
La Salle Products, Inc., Buffalo, N. Y.



Buzzer

(3)

A new midget buzzer with full tone has been announced. It is for use in aircraft or electronic instrumentations, wherever a medium-intensity audible-tone signal is required. Designated as Model 1702-0, buzzer has an overall size of 1 $\frac{1}{8}$ in. by 1 $\frac{1}{4}$ in. by $\frac{1}{2}$ in., and weighs 1 $\frac{1}{2}$ ounces. Mounting lugs are provided. Buzzer operates on from 6 to 48 volts dc or ac, as specified. It is equipped with phosphor-bronze springs and silver contacts. Variable volume and pitch are provided by double locking adjustments.

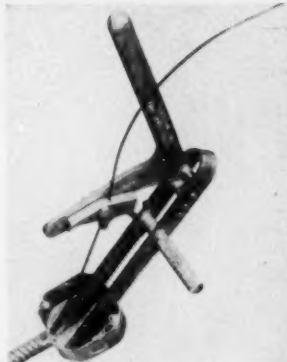
Auth Electric Company, 34-20 45th
Street, Long Island City 1, N. Y.

Adjustable Bar Hanger

(4)

Announcement has been made of the "Jiffy-Lock" adjustable bar hanger. It is available in two sizes and two styles to take care of all types of boxes and all sizes from 10 to 24 inches, for both new and old wiring work. There are no studs or beams to notch and no nuts to tighten. Slip box on Jiffy-Lock, extend hanger to desired length, tap end plates with a hammer flush with bottom of joist and it's set for nailing. Box can be moved to ends of hanger. When nailed, slip box to desired position, and flip lock.

Clyde W. Lint, 1144 West Washington Blvd., Chicago 7, Ill.

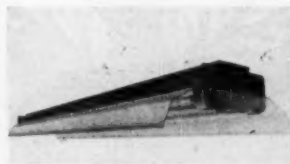


Fishtape Puller

(5)

A new "2 in 1" fishtape puller, which combines conventional hand puller with a detachable pressurized puller for more difficult jobs, has been announced. Known as "Little Giant", it pulls from top, sides and bottom, and is adjusted to pull at any angle, with any desired length of stroke. The controlled, automatic gripping and releasing action during operation eliminates kinking or snapping-out of fishtape. The sawtooth designed holding edge fits all standard outlet boxes, gutters, switches, etc., up to 8 inches. It is made with a reversible hand grip to provide either left or right hand operations.

Mallasch-Brandt Engineering Co.,
1032 No. Orange Drive, Los Angeles
38, Calif.



(6)

ALL-BRITE RLM Industrialist is designed for factory and general industrial use. It features certified porcelain enamel finish, standard or, multiple twin- or triple-turret lampholders, end plates for chain suspension, adjustable sliding hanger brackets for stem suspension, new joiner channels for end-to-end alignment in continuous rows, and flanges for louvers. Fixture is UL approved. Manufactured by Fluorescent Fixtures of California, 3320-18th Street, San Francisco, Calif.



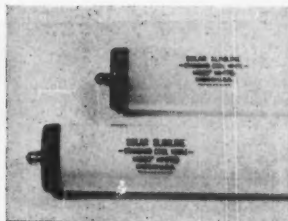
MODERN FITTINGS FOR

- thinwall conduit
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- flexible steel conduit
- service entrance cable
- grounding devices
- lighting fixture fittings

manufacturers for over 30 years

Sold Through Electrical Wholesalers
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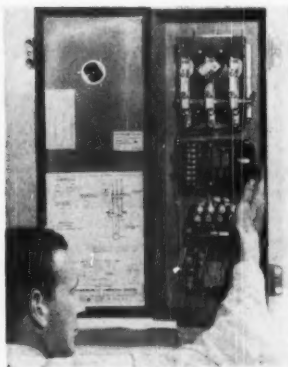
midwest
electric mfg. company
1639 walnut street chicago 12, ill



Fluorescent Lamps (7)

Announcement has been made of the addition of the new instant-start fluorescent lamps to this line. The new line consists of the 48 inch T12 49 watt tubes, 72 inch T12 65 watt tubes and 96 inch T12 75 watt tubes. They incorporate a single-pin base. Available in four colors: standard cool white (formerly 4500° white) and standard warm white (formerly warm tint) for use in those locations with either cool or warm atmosphere where the stress is on high efficiency, and deluxe cool white and deluxe warm white for use in those locations with cool and warm atmosphere.

Solar Electric Corporation, Warren, Pa.



Combination Starter (8)

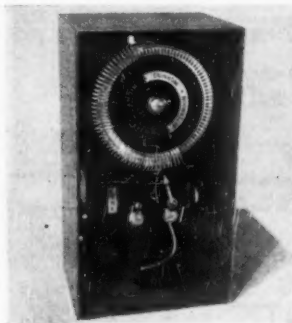
A new combination starter that conforms to the automotive manufacturers' Joint Industry Conference Electrical Standards for Industrial Equipment has been announced. It is available in both fusible and non-fusible types. A drip channel across the top and around the sides of starter's steel enclosure prevents liquids spilled on case from entering around door. Door has Neoprene rubber gasket which resists deterioration. Case contains no knockouts or mounting holes; outside mounting brackets being furnished. Prescribed machine-tool type transformer, with 230/460-115 volt multiplexed primaries, is included. Transform-

er has a built-in single-pole circuit breaker to provide short circuit protection for control circuits. A self-contained terminal board facilitates wiring. Up to four auxiliary interlocks for interconnecting circuits may be mounted. Interlocks may be changed from normally open to normally closed without adding parts.

General Electric Co., Schenectady, N. Y.



FLUORESCENT LUMINAIRES for school and commercial application have been announced. Called the "Mid-Century" line, it consists of a complete 2-lamp lighting system of 10 new luminaires. The 10 models use 5 lamp types including the 85 watt T-17 Krypton lamp and come in 3 lengths: 4, 5 and 8 feet. Manufactured by Mitchell Manufacturing Company, 2525 N. Clybourn Ave., Chicago, Ill.



Control (10)

A new time switch for programming daily operations—automatic heating, air conditioning and ventilating—has been announced. It has a range of from 1 to 48 "on" and "off" operations. The design of the timing tabs provides flexible, easy programming which may be readily changed. Each tab 15 minutes. The heavy-duty gear-train and telechron motor with a special enclosed switch, makes this a long life program control. Listed at 10 amps, single pole, 125 volt, 60 cycle. Also available for 220 volt, 60 cycle and Sunday and holiday cut-out.

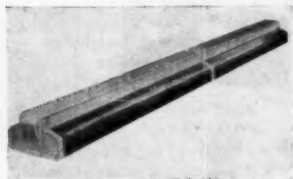
The Tork Clock Co., Mount Vernon, N. Y.



Switchboard (11)

A new line of switchboards, called Centr-A-Power, has been announced. It is designed to centralize power and lighting switching in one dead-front, free-standing package. Unit consists of a series of vertical rigid steel troughs into which are inserted all types of switching devices. All troughs are connected by continuous power bus which may be fed from bottom or top of trough. Standard 18 inch trough mounts circuit breakers up to 600 amps and fusible switches up to 200 amps, 600 volt maximum. Two larger size standard sections of 22- and 28-inch widths are available for fusible devices up to a 1200 amp maximum, and for circuit breakers up to 1600 amp maximum. All troughs are 90 inches high. Completely accessible from front, trough design conserves floor space and permits arrangement of installation in several types—"U", "L", back to back, or aisle.

Trumbull Electric Mfg. Company, Plainville, Conn.



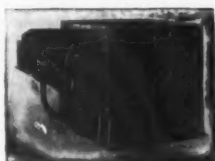
FLUORESCENT luminaires, a new series known as "Industrialist", have been introduced. They provide both direct and indirect illumination. Side panels and center V-bar reflector conceal a crosswise view of the lamps within approximately 25° of the horizontal. Manufactured by Curtis Lighting, Inc., 6135 West 65th Street, Chicago 38, Ill.

"Buffalo"
FANS

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ON THE FULL LINE**

- A Fan For Every Job—PROVEN On The Job
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- Request Bulletins 3222-F and 3720

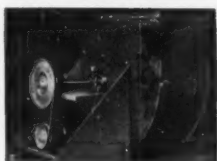


← **"L" BREEZE**

Complete unit for exhausting from hoods and vats—Motor isolated from moisture

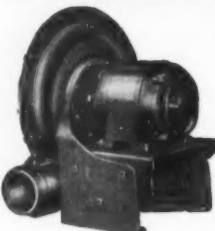
BELTED VENT SETS →

Light, versatile units for duct ventilation work. Non-overloading, quiet, efficient.



← **"H" BLOWERS**

Husky blowers—exhausters for forge, furnace blowing, tool cleaning, cupola work.



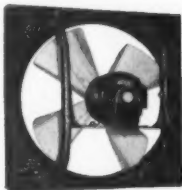
BREEZE FANS →

Heavy-duty, easily installed panel wall fans to ventilate small areas at low cost.



**"NV" HEAVY-DUTY
BREEZE FANS**

For heavy-duty ventilating work against as high as 14" s.p. Easily installed in walls.



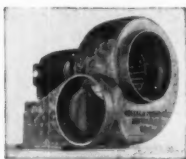
BELT-AIR FANS →

For free air delivery up to 19,000 c.f.m. 24" to 48" sizes. Wall-mounted and trouble-free.



← **BABY VENT SETS**

Movable conoidal fans for small-area ventilation or exhausting. Can be duct-mounted.



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3222-F
and
3720
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PANEL BREEZE FANS BELTED VENT SETS BELT-AIR FANS
BREEZ-AIR ATTIC FANS "L" BREEZE FANS "NV" BREEZE FANS



Pole Fire Barrier

(13)

Announcement has been made of a new pole fire barrier, made of a heavy special corrosion resisting wire cloth. It operates on principle of absorbing and dissipating heat so rapidly that combustible material on inside of barrier does not have opportunity to oxidize sufficiently nor get hot enough to reach combustion point. The cylindrical shaped barriers are made in various diameters to fit around different size poles. Height of barrier should be from one-third to one-half as high as highest grass likely to grow near barrier. Barrier can be obtained in flat panels for protection of buildings or special areas.

F. P. Smith Wire and Iron Works,
205 W. Wacker Drive, Chicago 6, Ill.



Suspension Yoke

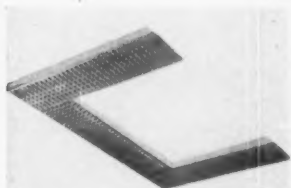
(14)

Announcement has been made of a new suspension yoke assembly designed to suspend two pendant-type lighting fixtures from a disconnecting and lowering hanger. It permits operation of lights of different types, sizes, and/or weights from a common outlet, and it is especially recommended for mercury-incandescent combinations. For use in aircraft maintenance buildings, industrial plants, armories, gymnasiums, public halls, sports arenas, and similar structures which utilize high-level lighting systems. Unit consists of a 30-inch length of aluminum channel; two 1/2 inch, steel, aircraft-cable slings; two end caps; and a

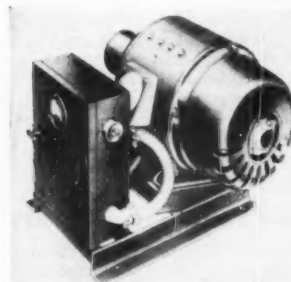
heavy-duty iron double hook with bronze safety latches. When necessary, a suspension-type transformer can be utilized with assembly. Transformer is suspended between lights from an attaching flange positioned in center.

The Thompson Electric Company, 1101-57 Power Ave., Cleveland 14, Ohio.

(15)



HARTFORD fluorescent luminaires in combination with the new Patternizer fitting, makes it possible for these units to be installed to form light patterns as desired on the ceiling. Hartford unit is available for use with general and slimline fluorescent lamps, in 4, 6 and 8-foot lengths. Three types of hinged door enclosures are available. Manufactured by The Miller Company, Meriden, Conn.



Generators

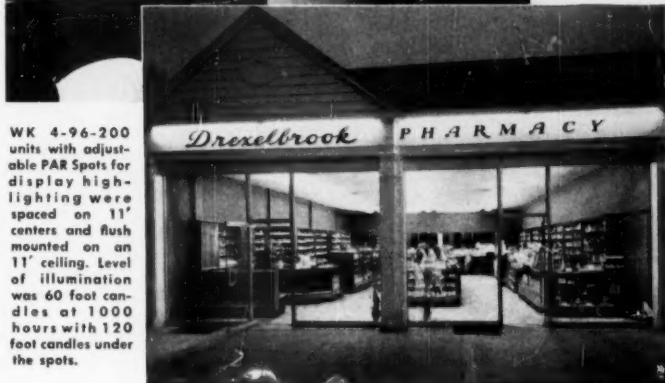
(16)

A new line of belt-driven, 115 or 230 volt ac generators has been announced. They operate from the power-take-off of any tractor or jeep. Six sizes, from 1000 to 10,000 watts, are available to fit the capacity requirements of farms, hatcheries, locker plants and other rural enterprises. Each unit is a complete package which includes generator, belt pulley, steel base, drilled for mounting, a control panel and an REA approved, weather-proof, two-pole, double-throw master switch which isolates the high-line when standby unit is generating. Proper belt tension is provided by correct balance and tension mounting of generator on frame. All parts are rust and corrosion resistant.

Winpower Mfg. Co., Newton, Iowa.



39 WK 4-96-300 Slimline Luminaires provide an average of 55 foot candles over working area at 2600 burning hours. Units are spaced on 13' centers and pendant mounted at 70" on a 14' 10" ceiling.



WK 4-96-200 units with adjustable PAR Spots for display highlighting were spaced on 11' centers and flush mounted on an 11' ceiling. Level of illumination was 60 foot candles at 1000 hours with 120 foot candles under the spots.

"White Knight"



2 AND 4-LAMP GENERAL DIFFUSE SLIMLINE LUMINAIRES

These streamlined, shielded slimline luminaires have an average reflectance of 90% and an average efficiency of 80%. Designed to provide easier installation and maintenance, therefore, lower these costs. They are available in 48", 74" and 96" units, for individual mounting or continuous runs.

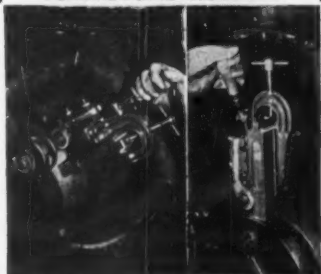
"White Knight" and other Magna-Lite Luminaires are fully described in our new Catalog including complete ETL Reports, Design and Construction Data, Mounting Details and Accessories. Write for your copy, today.

METALCRAFT PRODUCTS CO., INC.

Manufacturers of Fluorescent Slimline Luminaires

306-308 CHERRY STREET • PHILADELPHIA 6, PA.

MARTINDALE COMMSTONE HOLDERS



Hold Commstones rigid and true for concentric resurfacing of commutators and slip rings while running at normal speeds in their own bearings. Interchangeable boxes 1", 2" and 3" wide handle grinding jobs up to 4 1/4" wide.

SLOTING FILES



Rapidly undercut mica, leaving a V-shaped slot. Made in five sizes.

WIRE STRIPPER



Made to fit the hand, this tool which is made of the best grade spring steel has easily sharpened cutting edges.

ARMATURE WEDGE REMOVER



The coarse teeth on this tool bite firmly into wood and drive wedges and save time in removing them quickly.

WEDGE DRIVER



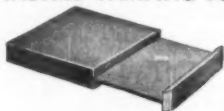
Has outer shell made of brass to avoid rust. Driving pin made from steel.

HANDLE TYPE COIL TAMPER



Same tamping as standard tool shown below but has 12" handle with spoon shaped end to press coils in place.

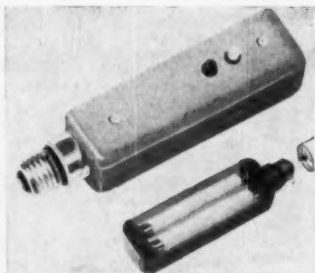
STANDARD TAMPING TOOL



Available in three sizes

Write for 64-page catalog of Martindale Maintenance and Production Equipment.

MARTINDALE ELECTRIC CO.
1309 Hird Ave. Cleveland 7, Ohio

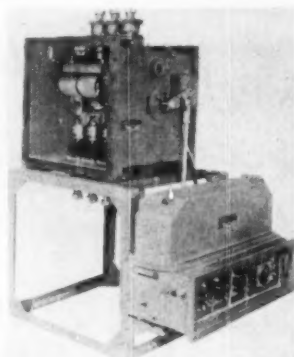


Fluorescent Bulb

(17)

Announcement has been made that incandescent work lights may now be converted to fluorescent supply by screwing a Lite-Mite bulb into any ordinary lamp socket. Bulb contains two 4-watt fluorescent lamps and all control components within the 2 by 6 inch shade. Lamp shade is of drawn aluminum. Illumination up to 500 foot-candles at 3 to 5 inch working distance is provided. Normally supplied for 115 volt 60 cycle operation, ratings of 220 volt 50 or 60 cycle ac and 110 volt dc may be supplied.

Stocker and Yale, Marblehead, Mass.



Transfer Oil Switch

(18)

A new switch unit to transfer load automatically to a Diesel standby generator has been announced. Unit consists of a 7500-volt, 3-pole, 400-ampere load-break oil switch and an automatic operating mechanism mounted on a frame of welded structural steel. Control transformers are mounted in oil switch tank, and all control wiring is completed at factory. Three connections—load, normal feeder, and standby generator—are required before putting unit into operation. When voltage of normal power source drops to 65% of normal, a control switch is actuated to start the diesel generator. A time delay relay in the control circuit allows diesel generator to build up to

full voltage before switch operates to transfer load. Operating mechanism will automatically return load to normal power source and stop diesel standby generator when normal power source is re-energized.

G & W Electric Specialty Co., 7780 Dante Ave., Chicago 19, Ill.



Plugs and Connectors

(19)

New conduit Type Ever-Lok plugs and connectors have been announced. The new design allows the use of any standard size BX connector fittings which can be connected to the R & S conduit type plugs and connectors. This feature permits cables to lie adjacent to mounting surfaces so that conduits and cables can be run close to machines and other industrial equipment. Recommended for limited space requirements.

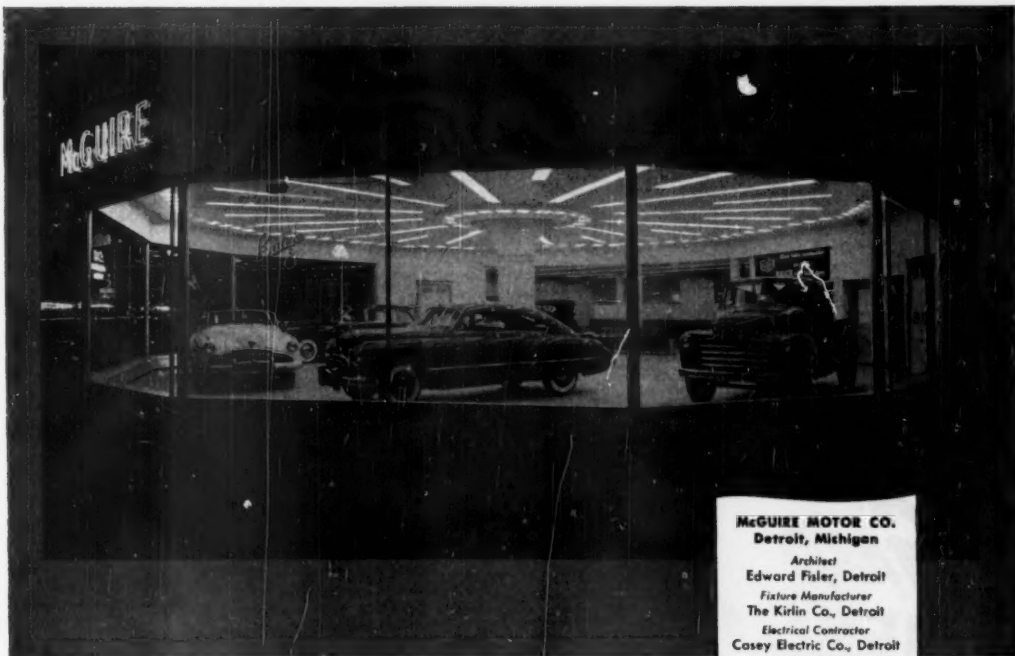
Russell & Stoll Company, Inc., 125 Barclay St., New York, N. Y.

Manual Starter

(20)

An improved manual starter, the motor sentinel Class 10-023, specially equipped with an indicating light to show when motor is running, is available. Useful for starting and protecting small ac and dc motors used with fans, pumps, washing machines, compressors and other industrial or domestic appliances, it is available as double pole switch with ratings up to 1 hp 250 volts ac or dc. Quick-make quick-break action is provided by an over-center self-indicating toggle mechanism. Positive bimetallic overload protection allows safe-capacity overloads but automatically disconnects motor on any sustained or damaging overload. Proper selection of replaceable heater allows sufficient time delay for small motor starting. Device is housed in a NEMA type I enclosure suitable for general purpose application.

Westinghouse Electric Corp., Pittsburgh 30, Pa.



McGUIRE MOTOR CO.
Detroit, Michigan

Architect
Edward Fieser, Detroit
Fixture Manufacturer
The Kirlin Co., Detroit
Electrical Contractor
Casey Electric Co., Detroit
Engineer
Roy W. Covey, Detroit
Glass
Corning ALBA-LITE

For Lighting That Sells—

Use CORNING ALBA-LITE

Here is a showroom lighting installation that is truly unique. With a light intensity of 82 foot candles and fixtures in an unusual radial pattern, it stands out day and night. To achieve this customer-attracting effect, Corning ALBA-LITE was specified.

Despite the high level of illumination in this installation, ALBA-LITE produces comfortable levels of panel brightness. Its non color selective properties assure that finishes are shown to best advantage. Even unlighted, the soft opal of ALBA-LITE presents an attractive appearance.

With an efficiency of over 90%, ALBA-LITE gives you maximum light transmission thereby reducing wattage requirements. Its smooth surface makes cleaning easy—keeps maintenance costs low. ALBA-LITE will not warp or sag in fixture frames and color transmission always remains true.

Available either flat or bent ALBA-LITE may be used for direct, semi-direct, semi-indirect and completely luminous ceiling. For complete information send for Bulletin LS-17.



CORNING GLASS WORKS

CORNING, NEW YORK

Corning means research in Glass

FOR EFFICIENT, ATTRACTIVE LIGHTING...

CORNING ALBA-LITE for diffusion of fluorescent light... CORNING FOTA-LITE for high level illumination... CORNING brand LENS PANELS and PYREX brand LENS LITES for prismatic light control

CORNING GLASS WORKS

Dept. EC-12, Corning, N. Y.

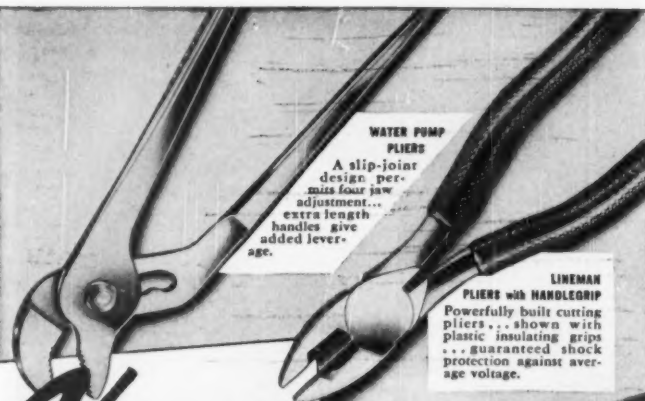
Please send me a free copy of your Bulletin LS-17 describing Corning ALBA-LITE.

Name _____ Title _____

Firm _____

Address _____

City _____ Zone _____ State _____



WATER PUMP PLIERS

A slip-joint
design per-
mits four jaw
adjustment...
extra length
handles give
added lever-
age.

LINEMAN PLIERS with HANDLEGRIP

Powerfully built cutting
pliers... shown with
plastic insulating grips
... guaranteed shock
protection against aver-
age voltage.

Vacuum Grip PLIERS

An Exclusive **Snap-on** Product

will far outlast
ordinary brands!

1. Hammer forged from special high carbon Silco-Molybdenum alloy steel.
2. Hardened with liquid heat and oil tempered clear through—not surface hardening only. Joints locally tempered electrically.
3. Scientific design which distributes strain over entire tool assuring maximum strength.
4. Smooth, perfectly matched, easy riding precision machined joints.
5. Sharp, deep milled teeth giving intense gripping power.
6. Hand filed, perfectly aligned blades on all cutters.
7. Spring tempered Vacuum-Grip "Non-Slip" handles.

25 patterns. Available only through Snap-on's nationwide, direct-to-user tool service... not at any hardware or mill supply stores.

HEAVY DUTY COMBINATION PLIERS

A popular favorite with automotive mechanics, combining powerful cutters with tremendous gripping strength.

DIAGONAL CUTTERS

Finest diagonal cutter made... hand filed, perfectly matched cutter jaws. Recommended for cutter pins and tough cutting jobs.

NEEDLE NOSE PLIERS

Despite the slender nose they are extremely rugged. Specially machined for wobble-free action.



Winch Hoist

(21)

A new $1\frac{1}{2}$ ton alloy winch hoist has been announced. With a 30 to 1 power ratio and tested to a 100% overload, weight of hoist is held to 8 $\frac{1}{2}$ pounds. Standard features include pre-formed flexible aircraft cable, stainless steel fittings and springs, plus oiled-for-life bearings. Handle is reversible and acts as a "safety valve" to protect user. If a rigging must be left overnight, handle can be removed in 10 seconds, leaving setup tamperproof. A combination of three swivel hooks and a built-in pulley block allows work to be done around corners, and as close as 10 inches at the $\frac{1}{2}$ ton rating. Locking is positive and automatic. Hoist can be operated in any position, and may be set for forward, reverse or free wheeling.

The Lug All Company, 331 East Lancaster Ave., Wynnewood, Pa.



Fuse Cutout

(22)

A new 100 ampere heavy-duty enclosed indicating fuse cutout has been announced. For use on high-capacity distribution feeders or whenever high interrupting capacity is wanted, the cutout has an interrupting rating of 5000 rms-amperes at 5200 volts and 8000 rms-amperes at 2500 volts. Housing is constructed of wet-process porce-



Snap-on Tools
THE CHOICE OF BETTER MECHANICS

**SNAP-ON TOOLS
CORPORATION**

8048-L 28th Avenue
Kenosha, Wisconsin

lain, glazed inside and out, and has a hanger support cemented into the back. Contact clips and terminals, silver plated, are cemented into housing interior. A barrier of synthetic sponge rubber forms a seal between upper and lower contacts and prevents arc gases from causing flashovers. When fusible section of fuselink melts, a spring-operated indicator arm pulls cable downward and out of tube.

General Electric Company, Schenectady 5, N. Y.



Earth Auger (23)

Known as the Pengo earth auger, a new twin-helix auger made to fit the highway earth boring machine and for use with all popular makes of power driven earth boring machines by means of adapters, is now in production. They are made in nine sizes for hole diameters to 36 inches. In addition to drilling ordinary ground, it will bore holes in hardpan, decomposed rock and some kinds of caliche and sandstone. The twin-helix design of auger eliminates back thrust against side of hole, making it possible to drill with less caving in sandy soil. Each half helix is equipped with a shank plate, each of which is provided with replaceable cutting points of abrasion-resistant alloy steel.

Petersen Engineering Co., 4126 26th Street, San Francisco, Calif.

Electric Heating (24)

Electric heating of large volumes of air for comfort and processing is now possible with a new series of Chromalox air blast heaters recently developed. Individual Finstrip heaters are assembled in banks to form sections of various sizes which are welded in one large frame for mounting in air ducts. Heaters have Monel sheaths and fins to prevent corrosion caused by moisture in air passing through ducts.



**KEEP
YOUR
EYE
ON
QUALITY**

No. 8826C

Made of sturdy one-piece bakelite, easily reinforced to withstand hard usage under all conditions. Fits either 3 1/4" or 4" outlet boxes. New improved cover keeps built-in mechanism dust free. Large exposed terminals for easy wiring. Available in white or brown with 3 types of chain lengths and connectors.

No. 8815C

Same construction as above, made of white glazed porcelain. Glazed track for easy chain movement.

No. 9816CX

Two piece glazed porcelain receptacle with removable interior having close fitting top for protection against dust. Either in 3 1/4" or in combination for 3 1/4" and 4 inch boxes. 3 types of chain lengths and connectors. Also available with convenience outlet.

A FINE LINE OF PERFORMERS

Through ceaseless search for improved construction, new materials and improved methods of manufacture, Leviton has developed a complete line of electrical devices, each designed to do a precise job.

Whatever your requirements, you can specify Leviton with assurance of the right style, the right quality, and the price to fit your job.

See the complete Leviton line
at all leading distributors



LEVITON MANUFACTURING COMPANY

MAIN OFFICE and FACTORY: BROOKLYN 22, N. Y.

WAREHOUSES: CHICAGO and LOS ANGELES

In Canada: No. 2, Board of Trade Bldg., Montreal

*This was the fire
that couldn't happen!*



THE CONSTRUCTION: FIREPROOF . . .
FIRE INSURANCE: MAXIMUM . . .

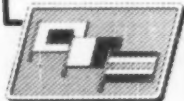
FIRE WARNING SYSTEM: **NONE.** And today smoke and charred ruins are the only remaining marks of a hospital that "couldn't burn."

Scenes like this are tragic proof that when it comes to fire, passive measures aren't enough. Fires are bound to happen — and your best safeguard is *positive* protection . . . check inspections 24 hours a day . . . a quick way of sounding an alarm . . . a sure method of getting help fast.

THAT'S WHERE COUCH FITS INTO YOUR PICTURE.

For Couch Fire Alarm Systems are on the job around the clock ready to help you avoid loss by getting action *quickly*. From among the many types that are made especially for hospitals, institutions and industrial plants, you're bound to find one right for your needs. Write today for Bulletin 116 for all details.

One of several types of Couch protective equipment . . . each fire and watch station transmits distinctive code signal which is recorded on paper tape along with hour and date . . . may be installed with a wide variety of signal alarms.



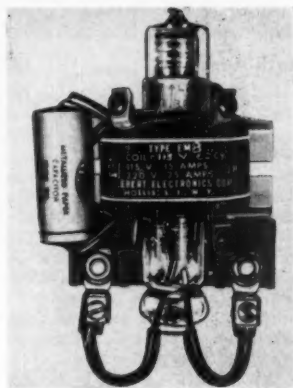
S.H. COUCH CO., INC.
DEPT. 812 NORTH QUINCY 71, MASS.

Private telephones for home and office . . . hospital signaling systems . . . apartment house telephones and mail boxes . . . fire alarm systems for industrial plants and public buildings.



All metal parts of frame are primed with a rust-prevention under-coating before painting with a black, baked-on heat-resistant enamel. Heater shown is rated at 440 volts, 192 kw. It is composed of four separate removable quadrants of 48 kw. each with operation flexibility provided by eight distinct circuits for stepped modulation. Complete heater can be wired for infinite control to as low as 10% of full rated capacity.

Edwin L. Wiegand Company, 7637 Thomas Blvd., Pittsburgh 8, Pa.



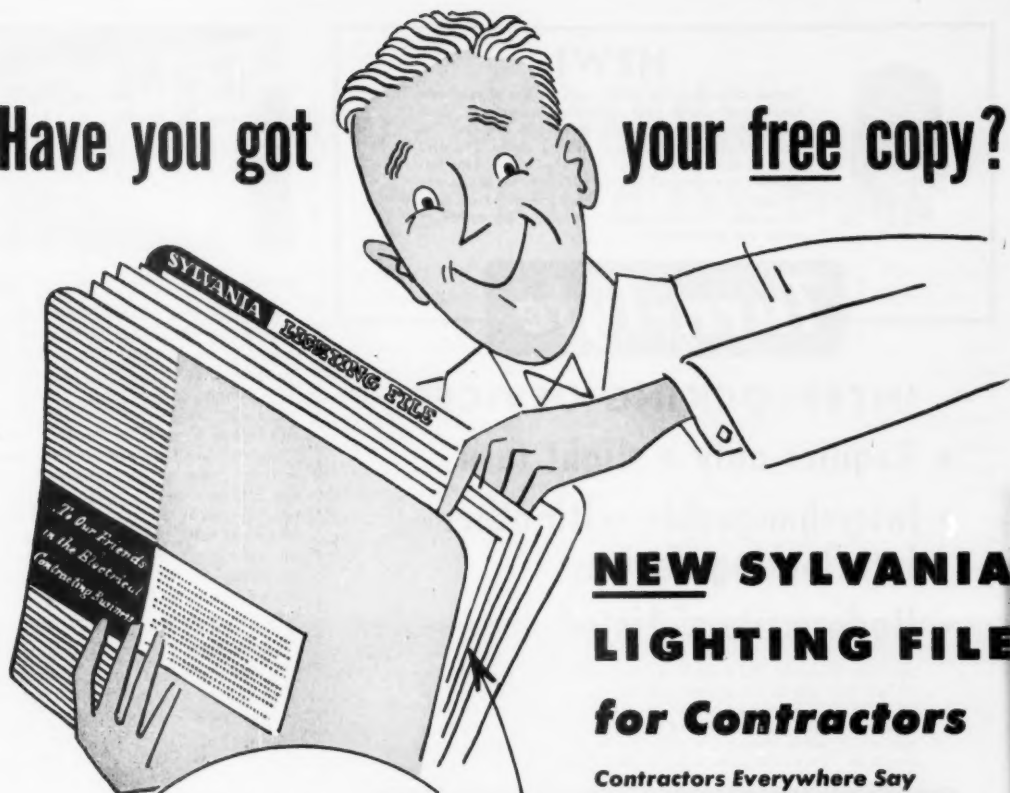
Relay (25)

A new sensitive high power relay (power amplification, 10,000) has been announced. It is of the mercury plunger type, has load ratings to 35 amp and 440 volt, and requires no maintenance because of hermetically sealed mercury-to-mercury design. Model EM-8 relay employs an energizing coil in a resonant circuit so that external contact (mercury thermometer, instrument contact, etc.) need only carry sufficient power to detune circuit. This external contact power is the equivalent of 100 volt—8 ma ac. Relay load rating is 35 amp 115 volt, 30 amp 220 volt, 20 amp 440 volt with unlimited inrush current.

Ebert Electronics Corporation, 185-09 Jamaica Ave., Hollis 7, L. I., N. Y.

Have you got

your free copy?



Here's what it contains:

Folder on Trimline Fixtures
Catalogue of Sylvania Fixtures
Booklet on School Lighting • Booklet on Office Lighting • Booklet on Plant Lighting • Booklet on Store Lighting
Flexi-Module Ceiling Folder • Price Sheets • All-line Folder • Sylvania Fixtures Guarantee with letter of explanation

PLUS information sheets on special items like screw driver and tool kits sold by Sylvania

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LIGHTING FILE
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**Contractors Everywhere Say
It's a wonderful aid to business!**

ALL THE INFORMATION AT YOUR FINGERTIPS!

It's a complete file of lighting information designed to make your work easier . . . and help you get more business!

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ELECTRIC**

Sylvania Electric Products, Inc.

Dept. L-2012

1740 Broadway, New York 19, N. Y.

Please send me copy of Sylvania Contractors
Lighting File.

Name _____

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City _____

Zone _____

State _____



NEW!

Rodale announces this new Turn-Tyte line of cord connector bodies that offer you many advantages. Each body consists of two pieces of molded bakelite. The base is armored and contains a cord clamp. The cord hole is .625 and the O.D. is 1 1/4". Positive heat-free conductivity is assured because all connector bodies and receptacles contain bronze contacts mounted on brass terminals. All metal straps and armor are coated to resist rust and corrosion.

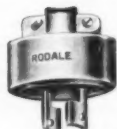
Turn-Tyte

INTERLOCKING DEVICES

- Require only a slight turn
- Interchangeable with other interlocking devices
- Underwriters' Listed

Adequate wiring calls for Rodale's new TURN-TYTE line of interlocking devices. They may be interchanged with other similar makes now in use. All TURN-TYTE devices are manufactured under a quality standard that combines exacting workmanship and the highest quality materials. Available at all leading Electrical Wholesalers. For a catalog and complete details on TURN-TYTE write today to Dept. ECM-1.

RODALE MANUFACTURING CO., Inc.
EMMAUS PENNSYLVANIA



2 Wire TURN-TYTE Armored Caps with Cord Clamp
10A—250V — 15A—125V
Dim O.D. 1 1/4"
Cord Hole .625
Catalog #1026
20A—250V
Dim O.D. 1 1/4"
Cord Hole .625
Catalog #1226



3 Wire TURN-TYTE Armored Caps with Cord Clamp
10A—250V — 15A—125V
Dim O.D. 1 1/4"
Cord Hole .625
Catalog #1036
20A—250V — 10A—575V
Dim O.D. 1 1/4"
Cord Hole .625
Catalog #1236



3 Wire Polarized Armored Cap with Cord Clamp
20A—250V
Dim O.D. 1 1/4"
Cord Hole .625
Catalog #1201



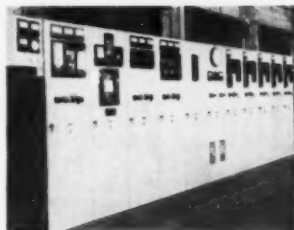
2 Wire TURN-TYTE Receptacles (Bakelite)
10A—250V — 15A—125V
Catalog #1020
20A—250V
Catalog #1220



3 Wire TURN-TYTE Receptacles (Bakelite)
10A—250V — 15A—125V
Catalog #1075
20A—250V — 10A—575V
Catalog #1275



3 Wire Polarized Single Receptacle (Bakelite)
20A—250V
Catalog #1230



Switchgear

(26)

Redesign of the indoor air-magnetic vertical lift, metal-clad switchgear to provide a more versatile unit and to conform with the recently adopted ASA standards has been announced. Maximum design rating on unit's circuit breaker is 4.76 kv and these "Ruptair" breakers are now available in three interrupting ratings—50, 150 and 250 mva. Service voltages on this type of switchgear range between 2300 and 4160 volts. More mounting space for instruments has been provided by increasing height of instrument panel from 72 inches to 92 inches. Additional features include a welded-in steel plate floor and guide rails on each side of breaker compartment. Number of required units may be reduced by utilizing available space above main bus and current transformer compartments for mounting auxiliary equipment. Secondary wiring is routed through separate metal-enclosed wiring ducts or encased in flexible conduit.

Allis-Chalmers, Manufacturing Co.,
930 S. 70th Street, Milwaukee, Wis.



Panel Instruments

(27)

A line of vernier panel instruments in three different sizes has been announced. Models are available in 3 1/2, 4 1/2, and 2 1/2 inch sizes and design is identical on all three sizes. The large scale provides greater readability under all light conditions. Etched faces extend across the front of the meters and are protected with unbreakable plastic. Vertical chrome-plated strips are recessed into plastic, fluted cover.

Simpson Electric Company, 5200 W. Kinzie St., Chicago, Ill.

Orders for Skylike[®] are piling sky-high!



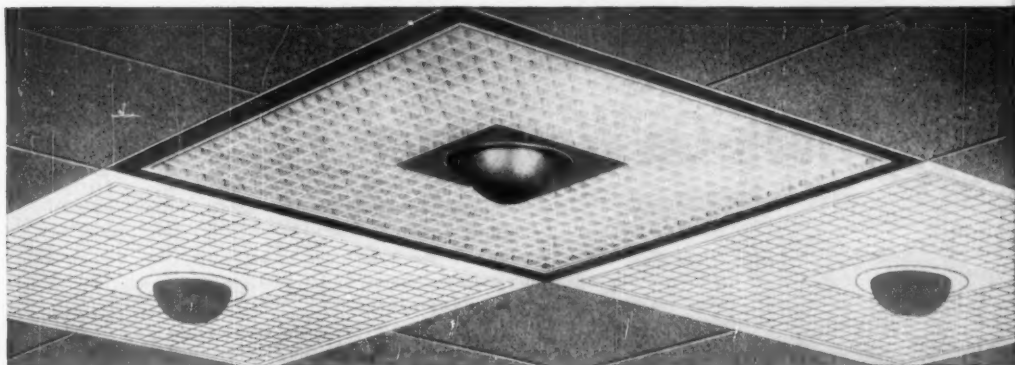
Silvray SKYLIKE[®] lighting — introduced a few months ago — has excited everyone in the business: user, architect, contractor, lighting engineer. Orders are piling up faster than we can fill 'em — but we're doing our best!

The problem is, steel is as hard to buy as SKYLIKE is easy to sell. The Silvray Lighting purchasing department just can't find steel fast enough to keep up with the skyrocketing popularity of this brilliant new concept of

commercial lighting. The outlook varies from week to week, however, so don't hesitate to inquire about deliveries. Silvray SKYLIKE units are being produced — and orders are being filled — just as fast as conditions permit.

Meanwhile, we'll gladly send you a copy of the fully descriptive catalog, "Skylike Louvered Incandescent Lighting Systems". Write to Room 1512, Graybar Electric Company, Inc., 420 Lexington Ave., New York 17, N.Y.

*Patent pending



Why so many businesses want Skylike



The SKYLIKE system combines the best features of silvered-bowl incandescent lighting with the architectural appeal of a fluorescent-type troffer. No other type of lighting has all its advantages! Here are some quick facts:

Warm color—most desired by merchandising experts.

High initial and maintained light output.

Softly diffused shadows.

Low brightness and 90° shielding.

No flickering, blinking, or hum.

Instant starting.

Variable lamp size—150- to 500-watt.

No light loss from darkened walls or ceilings.

Floor-service relamping—no ladders or scaffolds.

Hermetically sealed silver reflecting surface.

Units fit 24" x 24" ceiling tiles, fully or partly recessed, or surface-mounted, in rows or patterns.

Easily converted, with simple accessory, for directional or accent lighting.

Simple in construction; simple in wiring; free of ballasts, starters, transformers.

Lightweight; low-cost supporting construction.

87% reflection factor, easily maintained by occasional wiping with a damp cloth.

Low-cost! 1/2 to 1/3 the cost of equipment delivering comparable results.

SILVRAY

Skylike



NEW! NEW! NEW! NEW! NEW! NEW! NEW!

MEASURES POWER WITHOUT INTERRUPTING SERVICE !!



Hook-On Wattmeter

Type AK-2



LIST PRICE \$84.75
Type AK-2 Ratings
3-6-20-60-200-300 kw
15-600 amperes
100-600 volts

Now you can measure a-c power on non-metered loads without cutting conductors or interrupting service! Just clip the long voltage leads to terminals or binding posts, snap the hook around the conductor, and you're ready to read.

Ideal for trouble shooting, power surveys, and many other industrial applications, this new instrument is as easy to use as its older brother—the G-E hook-on volt-ammeter. It's simple to use, easy to carry—only weighs 3½ pounds.

With the AK-2 wattmeter you can measure power in either single-phase or polyphase circuits. Reactive power in balanced polyphase systems can be checked by using the AK-2 in combination with the AK-1 hook-on volt-ammeter. For this and other G-E testing instruments see your local G-E distributor, or write Apparatus Dept., General Electric Co., Schenectady 5, N. Y.

GENERAL



ELECTRIC

601-174

Product Briefs

(28) Sterling Electric Motors, Inc., Los Angeles, Calif., has announced that Speed-Trol electric power drives are now available in the single phase capacitor type design. . . . (29) The Hagen Manufacturing Company, Baraboo, Wis., is manufacturing a time switch utilizing a combination electric and spring driven clock. . . . (30) Clipper Manufacturing Co., Kansas City, Mo., has developed new saws for use on concrete floors, streets, airport runways, or asphalt.

(31) Rome Cable Corp., Rome, N. Y. has announced an improvement in its RoFlex non-metallic sheathed cable. It has a new gray finish, which is non-flaking and will not dust off or become flaky at high temperature. . . . (32) New England Carbide Tool Co., Inc., Cambridge, Mass. has developed a new Cyclo-Twist extra-length masonry drill. . . . (33) American Microphone Company, Pasadena, Calif., has announced a new dynamic full vision microphone.

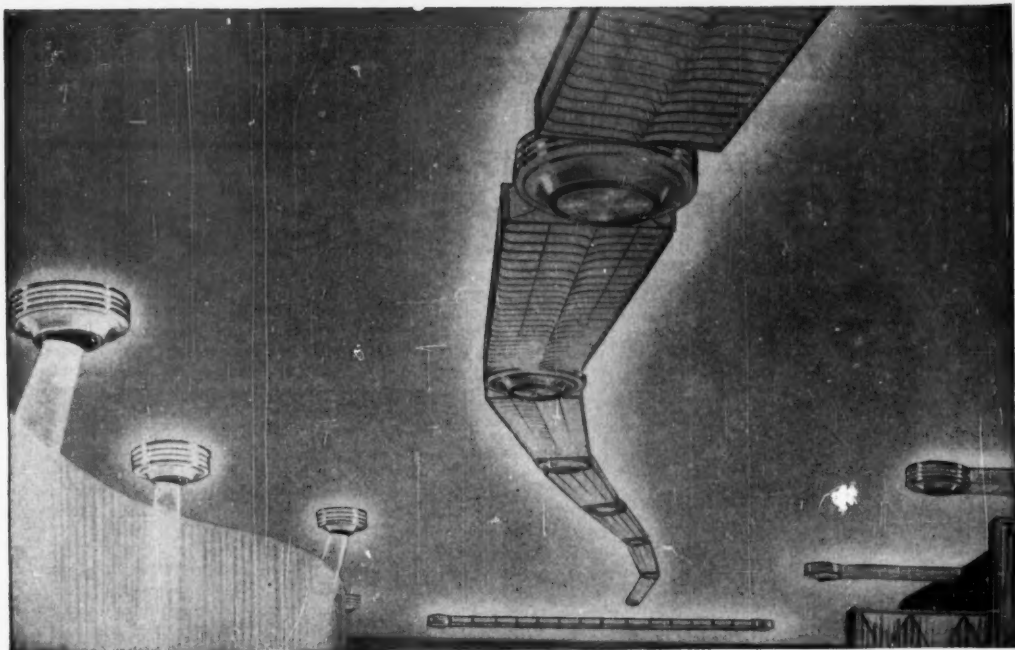
(34) Tweco Products Company, Wichita, Kansas, has announced new solder type lugs, "lug-set" splicers, block and punch. . . . (35) Kalen Electric and Mfg. Co., Eugene, Ore. has announced a new induction heater for heating ball bearings preparatory to installation. . . . (36) Alden Products Co., Brockton, Mass., has announced a new high voltage disconnect, designed to give protection to operator and provide a protective seal around contact against dust and moisture.

(37) A new line of concrete drill bits, known as "Stubbies", has been announced by Concrete Termite Drill Co., Pasadena, Calif. . . . (38) Carlson Products Corp., Cleveland, Ohio has announced a new plastic pipe available in threaded sections.

(39) Deluxe warmtone and deluxe cool white fluorescent lamps manufactured by Sylvania Electric Products, Inc., New York, are available in all standard wattages and sizes and in all slimline sizes. . . . (40) H. D. Hunter Co., Los Angeles, Calif., has developed the new "Smitty", a "5-in-1" tool for socket head screws and bolts. . . . (41) Announcement has been made by Allis-Chalmers Mfg. Co., Milwaukee, Wis. of the extension of its line of step-type (JFR) feeder voltage regulators with the addition of a new 50 amp, 38.1 kva, 7620 volt unit.

(42) A torque-arm reducer for output speeds from 115 to 330 rpm has been announced by Dodge Manufacturing Corp., Mishawaka, Ind. . . .

(43) International Telephone and Telegraph Corp., New York, N. Y., has announced a pneumatic tube system, incorporating a special selective dial in the carrier, for use in department stores, industrial plants and hospitals. . . . (44) W. H. Brady Co., Chippewa Falls, Wis., has colored wire markers of silicone treated cotton cloth with pressure sensitive adhesive backing.



Now you can "do things" with lighting, too!

Buy PLEXOLINE!—sensational new mass-produced lighting system with "flexibility." Simple combinations of Plexoline's linear and circular units produce any lighting patterns your imagination can invent. Graceful curves of light . . . circular contours . . . angular patterns . . . abstract designs . . . and more!

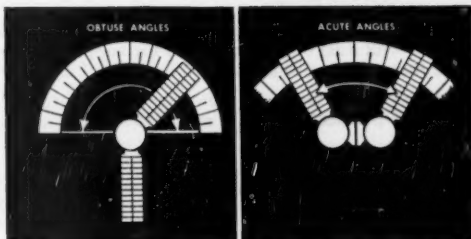
Best of all, Plexoline delivers this truly custom-tailored lighting at *standard cost*. It's modern lighting with all the traditional economies of Day-Brite **QUALITY**; Plexoline is carefully designed and produced to insure long years of trouble-free, efficient service at the *lowest* possible installation, maintenance and operating cost.

But you need the full PLEXOLINE story to properly judge its amazing advantages to you. Send for your free copy of "Plexoline — Imagination at Work." Day-Brite Lighting, Inc., 5402 Bulwer Ave., St. Louis 7, Mo. In Canada: Amalgamated Electric Corp., Ltd., Toronto 6, Ontario.

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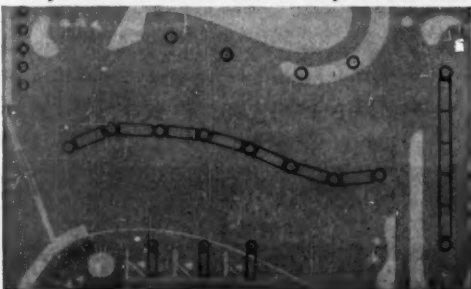


PREMIUM QUALITY WITHOUT PREMIUM COST



Plexoline is simple. No intricate wiring arrangements, no costly installation problems. All parts are uniform, fit accurately. Linear sections are available in a variety of lengths, 2- and 4-lamp, Slimline and standard Fluorescent. Circular units available as adjustable accent units.

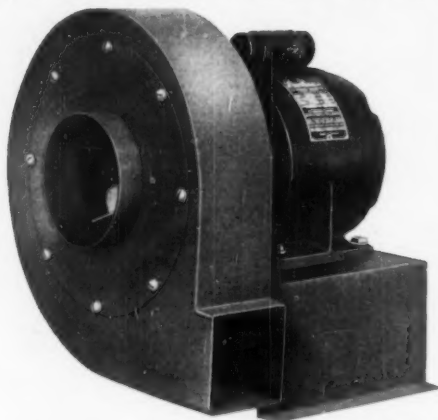
Now you Can DESIGN LIGHTING to Fit your Floor Plan!



Peerless Electric

PRESSURE BLOWERS

FOR SMALL EXHAUST SYSTEMS AND
FOR CONVEYING, COOLING, ETC.



PRODUCE A LARGE VOLUME OF AIR AT HIGH STATIC PRESSURES

● Peerless Electric pressure blowers are designed to produce a large volume of air at high static pressures with the advantages of a self cleaning paddle wheel.

These blowers are recommended for small exhaust systems where air is laden with dust or grit, and also for supplying high pressure air for conveying, cooling, etc.

The blowers are made in four sizes, with motors of $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{4}$ and 2 H. P., and wheels $7\frac{3}{4} \times 2$, $9 \times 2\frac{1}{2}$, $10\frac{1}{2} \times 2\frac{1}{2}$, and $12\frac{1}{2} \times 2\frac{1}{2}$, respectively.

WHEELS—Constructed with straight radial blades supported on a heavy back plate with heavy cast-iron hub, dynamically balanced and designed for efficient operation.

HOUSINGS—Arc-welded 16-gauge steel housings and motor bases for rigidity and long life.

MOTORS—Standard blowers furnished with single phase Capacitor-Induction type or three phase Induction motors. All are equipped with ball bearing, rigid mounted motors. Also available in other current characteristics for special applications.

ROTATION and DISCHARGE—Furnished for clockwise rotation, bottom horizontal discharge unless otherwise specified.

At time of installation housings or wheels may be turned for other discharges and rotation if so desired.

CAPACITIES—Tested and rated in accordance with codes adopted by National Association of Fan Manufacturers and the American Society of Heating and Ventilating Engineers.

GUARANTEE—Units are guaranteed against defective workmanship or material for a period of one year from date of shipment from factory. Each unit when shipped is registered and the serial number identifies it immediately for spare parts or duplicates.

Write for sheet giving complete specifications and prices.

THE PEERLESS ELECTRIC COMPANY

Established 1893 • WARREN, OHIO

Peerless Electric
MOTORS • FANS • BLOWERS

CATALOGS and BULLETINS

(45) **STORAGE BATTERIES** of nickel cadmium for utility services are pictured, described and specified in 2-color folder 136. Nickel Cadmium Battery Corp.

(46) **POWER AND CONTROL CABLE** construction with dimensional data as well as electrical and physical characteristics is subject of 60-page catalog covering high and low voltage power cables, service, street lighting and airport cables. Rome Cable Corp.

(47) **RUBBER PADS**, tubes and snubbers for reducing vibration, shock and noise of heavy equipment are discussed in folder 7290. B. F. Goodrich.

(48) **MATERIALS HANDLING** equipment for vertical movement in storage and production operations, such as stackers, hoisters, cranes and lifters, is covered in bulletin 28. Lewis-Shepard Products, Inc.

(49) **POWER TOOLS**, including bench and pedestal grinders and buffers from $\frac{1}{4}$ - to 5-hp with many accessories, are presented in bulletins 1010, 1020 and 1030. The Brown-Brockmeyer Co.

(50) **UNITIZED SWITCHBOARD** and motor generator for multiple circuit battery charging of driver-ride electric trucks is subject of bulletin 205. The Hertner Electric Co.

(51) **TACHOMETER** for production and maintenance testing, indicating belt slippage, machine speeds and speed variations and equipped with rotating gear shift, is described in 4-page 2-color folder. O. Zernickow Co.

(52) **CONTROL** for centrifugal compressor drives, of the wound-rotor induction motor type, is pictured, diagrammed and discussed in bulletin 650. The Ideal Electric and Mfg. Co.

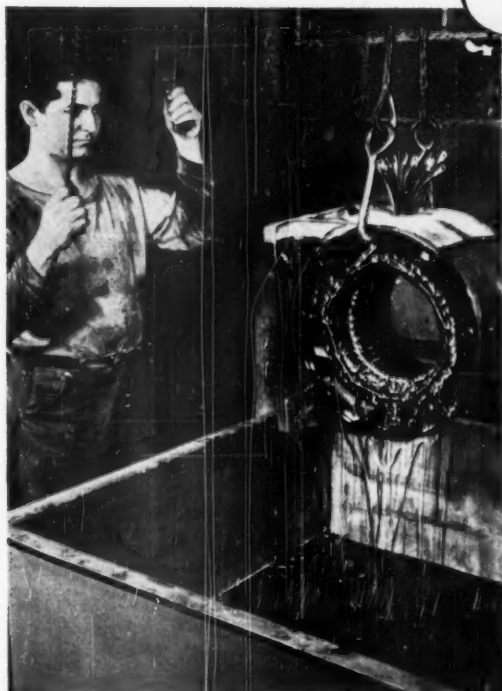
(53) **STEEL SHELVING** and locker catalog, including dimensions and prices of bins, files, cabinets, benches, stools and handtrucks, is published by Precision Equipment Co.

(54) **SLIPSYN** synchronous motor starters for operating and protecting synchronous motor drives. Booklet B479. Westinghouse Electric Corp.

(55) **ELECTRONIC TUBE** engineering manual and catalog, covering control-

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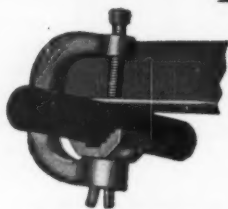
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rectifier tubes and illustrated with diagrams, tube ratings, applications and life expectancy, is published by Electrons, Inc.

(56) COMBINATION pump and air control, holding levels accurately and maintaining exact pressure, is discussed in bulletin 1500. Automatic Control Co.

(57) HIGH SPEED synchronous motors, drip proof and pedestal types with progressive ratings up to 6000-hp are presented in bulletin 43-200. The Electric Products Co.

(58) CATALOG PAGES listing price changes and new construction features of fluorescent fixture hangers, threaded covers and connectors are available from Appleton Electric Co.

(59) ALUMINUM CABLE, steel reinforced, is discussed as to conductivity, cost, strength, sag, safety limits and erection details. Reynolds Metals Co.

(60) HAND TACHOGRAPH for recording rapid speed fluctuations, with photographs and sample charts to illustrate the text, is subject of file sheet O. Zernickow Co.

(61) TV CONTROL and resistor replacement data sheets cover RCA, DuMont, Crosley, Stromberg-Carlson and Emerson models. Parts numbers, prices, functions and descriptions are included. Clarostat Mfg. Co., Inc.

(62) SLIMLINE diffuse general 2- and 4-lamp luminaries of the White Knight series, showing cross sections, distribution curves and test data, are presented in 2-fold 6-page folder. Metalcraft Products Co., Inc.

(63) FORK LIFT trucks with tilt, elevator and drive controls, multiple-disc clutch, air-cooled engine and roller-chain lift are sketched and specified in 6-page 2-color folder. Mobilift Corp.

(64) DRY TYPE TRANSFORMERS with capacities up to 10,000-kva, recommended for wide variety of applications from office intercom systems to large power centers, are discussed in 23-page booklet B4428. Westinghouse Electric Corp.

(65) EMERGENCY POWER for hospitals is subject of Power Points issue relating to standby generating equipment installed in U. S. medical buildings. D. W. Onan & Sons, Inc.

(66) MOTORS AND GENERATORS of high speed synchronous construction, from 500 to 1800-rpm, are pictured, sketched

and specified in bulletin 505. The Ideal Electric and Manufacturing Co.

(67) **SOLDERLESS CONNECTORS** for wiring and splicing are described in bulletin 750. Buchanan Electrical Products Corp.

(68) **FLUORESCENT lighting fixtures** for residential, commercial and industrial applications are pictured and priced in catalog 31a-Li. Lighting Products, Inc.

(69) **INTERCOMMUNICATION SYSTEMS** for offices, stores and factories with speaker and handset facilities and either code ringing, selective ringing or master station arrangements are discussed in circular 1652A. Automatic Electric Sales Corp.

(70) **CONSTANT CURRENT heavy-duty regulators** for series lighting of streets, airports, highways and subways are specified and explained in bulletin CCR478. Hevi-Duty Electric Co.

(71) **GREASES** for anti-friction bearings, ranging from liquids to heavy cap lubricants, are discussed in folder on lubrication maintenance and a selection chart. Master Lubricants Co.

(72) **LIGHTING CATALOG** covering complete line of commercial and industrial fluorescent and germicidal lighting equipment is published by Edwin F. Guth Co.

(73) **HOOD HEATERS** using infra-red lamps, designed to keep car motors warm and dry for quicker starting in cold weather, are described and priced on 2 file sheets. Wagner-Green Co.

(74) **CONTROLS AND RESISTORS**, such as wire-wound and composition-element controls, ballasts and line-voltage regulators, power rheostats, TV beam benders and attachable shafts and switches, are subject of new Catalog 50. Clarostat Mfg. Co., Inc.

(75) **INSTRUMENTS** for indicating, controlling and recording, such as thermocouples, radiation detectors and resistance bulbs, are in data book and catalog TC8. Wheelco Instruments Co.

(76) **SOLDERING tips** concerning fluxes and solder tables, specific soldering operations and step-by-step procedures for TV technicians, electricians and lab workers are contained in 20-page pocket manual. Weller Electric Corp.

(77) **MAGNETIC STARTERS** and contactors in sizes 0, 1, 2, 3 and 4 are discussed in Data Folder with engineering and design information. Arrow-Hart & Hegeman Electric Co.

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A wise old man called his quarrelsome sons about him. Taking up a bundle of sticks, he commanded each in turn to break the sticks. All tried, but in vain, and said it could not be done.

"And yet, my boys, nothing is easier to do," said the father, as he undid the bundle and broke the sticks, one by one. "By this example, you can see that united you will be more than a match for your enemies; but if you quarrel and separate, your weakness will put you at the mercy of those who attack you."

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Aesop told it 2,500 years ago. You, a patriot, believing in individual liberty and freedom for all, see our American way of life threatened by the menace of communism abroad and jeopardized at home by complacency, negligence, confusion and incompetence.

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Reader's Quiz

Phasing Conductors

QUESTION F-17—We are installing a 3 conductor No. 00-3000 volt insulation Neoprene type power cable in a mine tunnel—3850 ft. from portal to inside station. This cable is to carry 2300 volts. Already installed and in use for several years is a No. 6—3 conductor 3000 volt insulation cable with varnished cambric insulation, a lead sheath and a spiral steel ribbon protective wrapping. The distance between the two cables is approximately 3½ ft.

Would we be able to phase these cables out and tie them in parallel and would they each pack their rated share of the load? There are no air pipes or other metal lines, except messenger cable within 6 ft. of either cable.—D.M.

ANSWER to F-17—According to Section 3105 of the National Electrical Code, your installation would be prohibited unless special permission is granted. Section 3105 is stated in part as follows: "Conductors in sizes 1/0 to 500 MCM inclusive may be run in multiple provided they are of the same length and have the same circular mil area and the same type of insulation. Not more than three 1/0, four 2/0, nor five Nos. 3/0 to 500 MCM conductors inclusive may be run in multiple. Except as herein provided, conductors shall be run in multiple only by special permission....."

You would have no difficulty phasing out the conductors, but the division of the load is not assured because of the difference in cable impedance; in addition, overcurrent protection provided in the form of a circuit breaker or fuses for one cable would not adequately protect the other cable, assuming, of course, that this protection was installed to protect the larger cable.—E.C.E.

ANSWER to F-17—There is, of course, no problem in phasing out the cables and connecting them in parallel. However, each would not pack its rated share of the load. The small cable would be underloaded. This comes about as follows: The load (that is, current) division is inversely proportional to the impedance of the cables. The resistance of the 00 cable is .092 to .099 ohms/1000 feet per phase, for temperatures from 60 to 80

C. The reactance is, roughly, .04 ohms/1000 feet, hence the impedance $\sqrt{.095^2 + .04^2} = .10$, approximately. For the number 6 cable, the resistance is .496 ohms/1000 feet at 85 C, the reactance again .04, very roughly, hence the impedance approximately .5. The impedance ratio for the two cables, is therefore 1:5. Consequently, where the cables are connected in parallel the 00 cable will carry 5 times the current of the number 6. Now, what are the permissible current ratings? A three-conductor number 6 cable, with varnished cambric insulation, shielded, carries 81 amps. in air, for 40 C ambient and 85 C maximum temperature (85 C the limit established for VC). The Neoprene-jacketed cable has a "rubber" insulation which is not specified in the questions. Depending on the type of "rubber", the permissible temperature limit may be 60, 70, or 80 C. For these three temperatures, the following currents are permitted for a three-conductor 00 cable in air, 40 C ambient temperature:

Maximum temperature	60 C	70 C	80 C
Maximum current	132	159	184 amps.

Let us assume that the Neoprene-jacketed cable has a 70 C insulation hence may safely carry 159 (or 160) amps. At this current, the old number 6 cable will carry 1/5, or 32 amps. while it may carry 81 amps.

When necessary, proper load division can be brought about by connecting resistance, or preferably inductance, in series with the 00 cable.—L.F.R.

Fan Installation

QUESTION H-17—We have two identical fan installations in which both fans are driven by 15 hp., 3 phase, 220 volt motors and V-belt drives. Both motors are of the same manufacture and wired correctly with all necessary protection and controls and with three No. 6 wires not over 50 feet from a circuit breaker type distribution panel.

Circuit breakers used for branch circuit protection are of 70 ampere capacity, yet the ampere reading of one motor is 40 amperage and of the other motor 44 amperage per phase. However, our main trouble is that both the wiring and conduit for the motor draw

ing 44 amperage are overheating and continuously warm. Also, the branch circuit breaker on this particular motor will always trip and not allow the motor to be started more than once within intervals of 20 or 24 minutes. Changing breakers has no effect on this.

We are under the impression that there is an incorrect connection within the motor, causing a stray or reactance current to be set up in the circuit wiring which, in turn, is the cause of this wire and the conduit overheating between the panel box and the motor, but would like to receive other opinions before complaining to the manufacturer.—J.L.

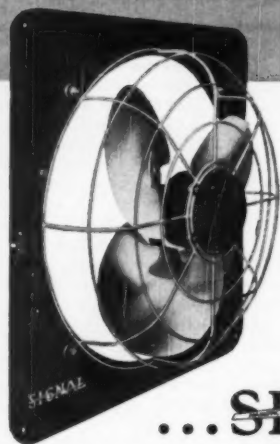
ANSWER to H-17—There are several considerations before placing the blame directly on the motor and complaining to the manufacturer which must be considered at this time. Check the line voltage at the motor terminals. If this line voltage is higher or lower than 10% of the voltage stamped on the motor nameplate, this will cause the motor not to produce its rated torque without drawing excessive current and consequently this will cause it to overheat, whether the motor is not loaded or loaded.

Various manufacturers of electric motors from time to time make motors for different frequencies other than 60 cycles. In the course of shipping out motors by the manufacturer, sometimes a motor stamped 50 cycles instead of 60 cycles, operating this motor at a 60 cycle frequency will cause it to overheat. Likewise, if your 60 cycle frequency is 10% above or below, the motor will also overheat. It may be, too, that the motor is starting on three phase but run single phase in which case the running contacts of the compensator may be defective.

Then again, the motor may have been covered to keep out dust and dirt as well as moisture. By this means, the motor will also heat up, and, too, the motor may be jammed with dirt and dust which would tend to cut down the amount of cooling air circulating through the motor.

If the preceding fails to correct the trouble, then the only remaining thing to do is have the motor checked and if found to be defective, then it should be returned to the manufacturer for repair or replacement.—L.C.D.

A NEW CHALLENGER!

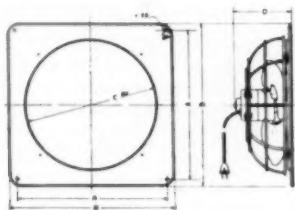


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DIMENSIONS IN INCHES

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B	26"
C	21"
D	7 1/8"
E	2"
F	5 1/8"

SPECIFICATIONS

No.	Fan Size	Volts	Cycles	Input Watts	High		Medium		Low		Weight Lbs.	
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V-520A	20"	115	60	186	1035	3300	870	2500	725	2100	21	32

SIGNAL ELECTRIC MFG. COMPANY
MENOMINEE 4, MICHIGAN

ANSWER TO H-17—From the data given by J. L., it is apparent that his troubles are caused by a combination of an overloaded motor and a branch circuit breaker that is too small.

It is evident that the two units were installed without checking the speed of the fans and adjusting the motor pulleys as necessary to get the desired fan performance and motor loading. My experience indicates that the above check is neglected in nine out of ten fan installations, unless trouble develops, because the men installing the units falsely assume that they were adjusted in the factory. I am confident that if the troublesome unit is slowed down enough to drop the motor load from 44 amperes to 40 amperes (normal full load current on the motor, that all heating problems will be eliminated.

Assuming that the running protection on the motors is correct, it is evident that the 70 ampere branch circuit are too small for the motors involved. I would suggest that 100 ampere branch circuit breakers be used on the above circuits so that the motor controller will be able to assume its function in protecting the motor. Table 20 of the National Electrical Code permits 100 ampere branch circuit breakers with #6 AWG conductors when used for motor branch circuits.—R.E.

Transformers

QUESTION G-17—We want to wind some 110 to 32 volt 200 watt insulating transformers for use with extension cords in wet locations. Can you give a formula for the iron, wire size, etc?—W.P.R.

ANSWER TO G-17—Transformers of this type are commercially available—being catalogued as standard items. You will find it more economical to purchase these transformers than to build your own.—P.S.

Motor Starting

QUESTION Q-16—Most 3 phase motors will blow one fuse when applied on a single phase line of the proper operating voltage. Now, the question is, what type of winding is used in a 3450 rpm. saw motor which was continued in use, starting and stopping without the operator's knowledge that one of the phases was out due to a blown fuse? The motor is a 220 volt 3 phase started by a magnetic push-button type switch fed by a fused safety switch. Attention was drawn to

the blown fuse by the fact that the motor did not come up to running speed in proper time.—E.S.H.

ANSWER TO Q-16—If the three-phase saw motor winding is delta connected and the phase to which the magnetic pushbutton switch is NOT connected is open-circuited due to a blown fuse, the winding changes to two parallel paths: one, with one phase-winding, and the other, with two phase-windings in series across the single-phase line. The current through these two sets of windings, in this case, are evidently not in phase, resulting in a torque sufficient to cause rotation. The starting torque required is that needed to turn over the rotor practically without any retarding torque, especially if ball bearings are used.

Starting and running winding resistances and reactances have a definite ratio for optimum conditions of starting in a single-phase motor. The proper selection of parameters will usually result in half to full load starting torque. While it is difficult to set down definite ratios of starting to running winding resistances and reactances, the former usually varies from 1.5 to 3 and the latter ranges from 0.5 to 0.8 which is practically the ratio in this case.—R.G.C.

ANSWER TO Q-16—If the motor is of the "shaded pole" construction, that is, if there is a short circuited coil about part of one or more pole faces the motor will start on a single phase circuit, such as will result with one fuse blown. These coils might be provided to give added starting torque or there may be one or more accidentally shorted coils in the armature.

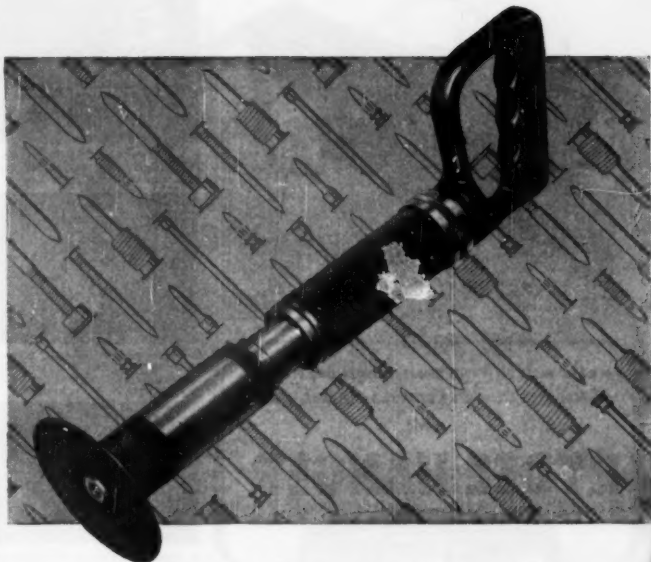
The starting torque under single phase conditions will be less than normal and so the motor will require more time to reach normal speed.—J.E.W.

Radioactive Material

QUESTION S-16—What precautions should I take when I am asked to repair an item that may be radioactive? —H.S.

ANSWER TO S-16—The National Bureau of Standards handbook H-42 safe handling of radioactive isotopes treats the subject very fully. This booklet can be had for 15 cents by writing the Superintendent of Documents, U. S. Government Printing Office, Washington, 25, D. C.—B.C.M.

ANSWER TO S-16—Since H. S. does not say what kind of radiation particles he suspects he comes in con-



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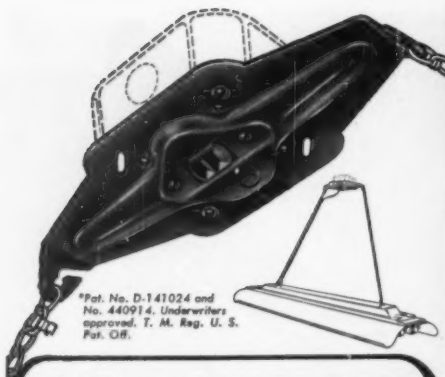


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only two screws needed. No
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Screwdriver only tool needed.



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Hydee Hanger, com-
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5-ft. chains, "S" hooks
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tact with, it would be hard to suggest more than that he call on a physicist for expert advice. Contrary to the general belief that the Geiger counter tells the story, it is only a guide to be used with the least harmful types of radio-active particles. The scientists are trying to develop a universal radiation detection meter, but I do not believe one has been developed to date. It should also be pointed out that the effects of the various types of radiation particles on people is pretty much in the "guess stage" and that the guide lines relative to exposure are being constantly changed as our knowledge on the subject increases. Having had experience around places where radiation was a consideration, I am confident that physicists will do their best to keep the rest of the human race away from danger just as we electrical engineers and electricians try to protect others from the dangers of electricity.—R.E.

Signalling Transformers

QUESTION T-16—I understand most bell or signalling transformers are made so that a short on the low voltage side will not burn out the transformer. Is this done by using small wire on the primary or secondary or by changing the arrangement of the wiring or iron?—C. S.

ANSWER TO T-16—A certain group of low-power transformers is so designed that a short on the load side will not burn them out, or blow a fuse on the supply side. In addition to bell and signalling and toy transformers, the group includes luminous sign, oil burner ignition, filament heater transformers for large electronics tubes, and others. Ordinary transformers are designed in such a way that the secondary voltage is substantially constant, for any load current between zero and rated. These transformers, however, have a load characteristic (secondary voltage versus secondary current) that looks like a quarter of a circle.

This effect is produced by the design of the magnetic circuit, by providing high leakage reactance. Each transformer with two windings has three fluxes, one main flux which interlinks both windings and which effectively transfers the energy from the primary to the secondary side; and two leakage fluxes, which are only interlinked with their respective windings and which do not contribute to the energy transfer. Ordinarily, the designer tries to suppress the leakage fluxes as much as possible, aiming at a linear characteristic (secondary

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PROTECTS — Automatic thermal relay cuts out defective lamps, eliminates annoying blinking and protects all auxiliary equipment.

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voltage constant irrespective of current). In the high-reactance transformer, the leakage fluxes are purposely made large. This results in the circular regulation curve shown, with the effect that at rated current, or at a specified small overcurrent, the secondary voltage at the transformer terminals is reduced to zero.—L. F. R.

ANSWER TO T-16—Most bell and signalling transformers are so designed as to allow the secondary voltage to drop rapidly with increasing load. This characteristic results in poor voltage regulation and an inherent current-limiting feature. Even in a transformer designed for good voltage regulation, all of the flux that links the primary, does not link the secondary and vice versa. In fact, most power transformers are designed with sufficient leakage reactance to limit a possible short-circuit current to from ten to twenty times full load current, according to service conditions. The voltage ratio is, therefore, not exactly equal to the turns ratio of the two windings. In a transformer intentionally designed for higher leakage flux under load, the primary and secondary windings are sufficiently spaced to cause the voltage across the secondary to drop very rapidly so that with decreasing load resistance, the increase of load current will be proportionately much lower. It is for this reason that most bell transformers whose secondary voltage does not exceed 15 volts and the rating 50 watts, are permitted to be installed without protective fuses.—R.G.C.

Can you ANSWER these QUESTIONS

QUESTION Q17—When splicing a 2300 volt primary cable, 3 conductor, No. 4, cambric 5000 volt insulation, lead covered, in an electric man hole, below ground surface, isn't it customary and the generally accepted practice to carefully pour an approved cable compound in the completed wiped lead sleeve to drive out the moisture and air?

All my reference data seem to stress the proper pouring of an approved compound.

Recently a splice in such a cable was made in this locality by a cable splicer, and the lead sleeve was not filled with any compound.

I maintain this job was not done right, and is not a good reliable long life job, because there is moisture and air in the lead sleeve.—G.F.

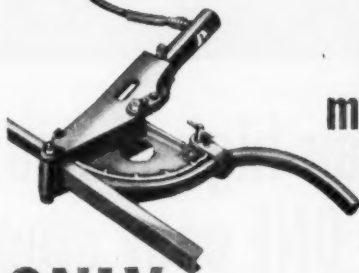
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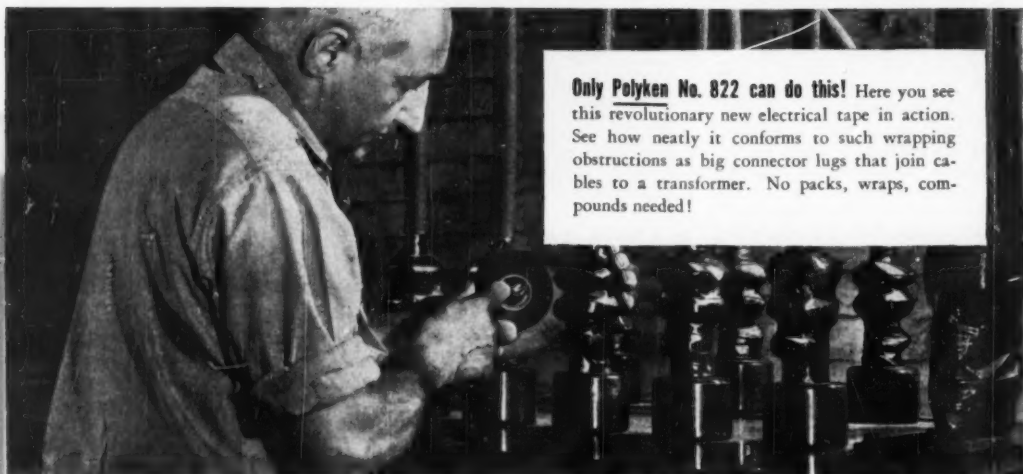
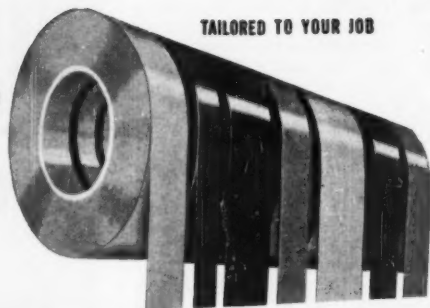
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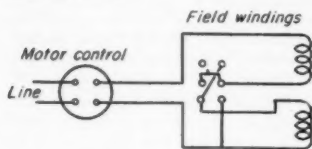
Questions on the Code

Double Throw Switch Connections

Q. In your department "Questions on the Code", sometime ago a question appeared that was signed "A.E.B.", asking for a wiring diagram with a double pole, double throw switch, to run an induction motor on either 110 or 220 volts.

Mr. Squires answered that a double pole, double throw switch would not be sufficient for that purpose and he gave a diagram using a 4 pole, double-throw switch.

We have been using a double pole, double throw switch for this purpose for many years and I will give the diagram here:



I am now wondering if Mr. Squires would not approve of this type of circuit.—R.E.

A. The connection shown above takes care of only half of the problem, as it does not provide for changing the supply line from 110 to 220 volts, so, while it is all right as far as it goes, it does not go far enough. With the arrangement shown above, another double throw switch is necessary.—F.N.M.S.

Switch for Motor

Q. Will the use of a 30 ampere two pole enclosed switch be considered as both the controller and disconnecting means for a one horsepower single phase 110 volt motor?—R.C.G.

A. Under Section 4407 of the Code, you will note that a switch or circuit breaker which has an ampere rating of at least twice the full load current rating of the motor provided the motor is rated at 2 horsepower or less may be used as both the con-

troller and the disconnecting means to the motor if it opens all ungrounded conductors to the motor, is protected by an overcurrent device ahead which will open all ungrounded conductors supplying the switch or breaker. Therefore in the average installation, inasmuch as the circuit to such a single switch acting as both a controller and a disconnecting means must emanate from a distribution panel in which the circuit conductors to such a switch are properly protected with overcurrent devices, it is often possible to utilize a single switch as both the controller and the disconnecting means for a motor.—G.R.

How Many Outlets On a Circuit

Q. How can we tell how many outlets are allowed to be connected to 15 amp, 20 amp, 30 amp., etc. circuits? Where is it covered in the Code?—E.F.S.

A. The term "how many outlets per circuit" is no longer used in the Code, Sections 2115 and 2116 of the N.E. Code covers this matter. If you wish to figure the number of 15 amp. circuits required for lighting a dwelling occupancy you will find by reference to Section 2116 A that you compute the total lighting load on the basis of the area of the dwelling at 2 watts per square feet as covered by the table shown in Section 2203 A. For example a dwelling having a floor area of 1200 sq. ft. would require 3 circuits.

$$2500 \times 2 \text{ watts/sq. ft.} = 5000 \text{ watts.}$$

$$5000 \text{ watts} \div 115 \text{ volts} = 43 \text{ amperes.}$$

$$43 \text{ amperes} \div 15 \text{ amps/cir.} = 3 \text{ circuits.}$$

Remember, however this only covers the lighting circuits and an additional circuit for appliances must also be installed. On these three circuits you may place as many outlets, for lighting purposes, as you wish provided the load is proportioned evenly among the circuits.

Assume you are wiring a barn on farm property. Since table 2203 A

does not cover barns on the basis of watts per square foot, we refer to Section 2116-b (other loads.) We now find that all outlets in the barn must be figured on the minimum basis of 1 1/2 amperes per outlet. This would permit 10 outlets on a 15 amp. 115 volt branch circuit or 13 outlets on a 20 amp. branch circuit. Remember, however, any specific load to be wired must be considered separately in line with its rating.

Another example is a factory. Table 2203 A does not cover factory lighting on a watt per square foot basis, so again we refer to Section 2116-2b. Let's assume that heavy duty lampholders are specified for lighting. We now must figure a minimum of 5 amps per outlet for such lampholders which would result as follows.

$$50 \text{ amp. br. cir. } 50 \div 5 = 10 \text{ outlets/circuit.}$$

$$30 \text{ amp. br. cir. } 30 \div 5 = 6 \text{ outlets/circuit.}$$

$$20 \text{ amp. br. cir. } 20 \div 5 = 4 \text{ outlets/circuit.}$$

$$15 \text{ amp. br. cir. } 15 \div 5 = 3 \text{ outlets/circuit.}$$

Let's assume a school lighting job. According to Table 1203 A we must figure a minimum of 3 watts per square foot for school lighting. Here again you figure the load on this basis and compute the circuits required according to the circuit capacity, 15 or 20 ampere.

The question you have raised can be thoroughly understood only after a study of Articles 210 and 220 has been made. Hope we have clarified the matter. If you have any specific case in mind which remains doubtful do not hesitate to write again.—B.A.McD.

Switch Box As Junction Box

Q. In a recent installation of fractional horsepower motors, a fuse disconnect switch was installed at the within-sight location on a 220 volt, two wire circuit, to serve as overcurrent protection and disconnect for two fractional horsepower motors used as pin setting equipment in a bowling alley. Each motor was connected individually to this two pole,



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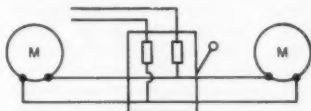
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fused switch and individual lugs were used on each conductor at the terminals in the disconnect switch. The inspector rejected this installation stating that it was a violation of paragraph 4307, Article 430, that inasmuch as we had run out of this disconnect switch with two cables to the motors, the switch was being used as a junction box.

The question is, is the intent and purpose of the National Electrical Code in Paragraph 4307, Article 430, to prohibit the entering of a service or disconnect switch with more than one set of conductors or taps without the use of a junction box or gutter installed under the switch?—I.B.L.



A. The last phrase of Section 4307 provides the answer to this often troublesome requirement. If the design of the enclosure is such that ample space is provided for the wires and their connections, the Code does not prohibit an installation as described above. However, excessive lengths of wire between the knockouts or connectors and the terminal screws on the fused switch, would justify the inspector in complaining.—F.N.M.S.

Range Connection

Q. We have a problem which has resolved itself into quite an argument and will appreciate your interpretation of the Code concerning it. We want to know if ordinary service entrance cable may be used on an electric range connection and concealed within the walls or floors of a building after it has been fused at the main point of entry in the building. In the past we have used a 60 ampere main range combination switch and have used the range side with 35 ampere cartridge fuses. Now we are told we cannot use service entrance cable when it is concealed within the walls or finished floors as a circuit to the ranges. Is such a ruling correct?—M.A.S.

A. Under Section 3382 of the N. E. Code, you will note that approved service entrance cables, Type SE or ASE, may be used for the range or domestic water heater circuits even if the identified conductor or neutral is without individual insulation provided the cable has a final non-metallic outer covering and the supply is alternating current not exceeding

150 volts to ground. You will also note that no reference is contained as to any other limitations concerning the method of installation, therefore this cable may be run either in the open or within concealed spaces of either floors or walls. There are, of course, many cities where specific ordinance requirements make it mandatory to use materials other than service entrance cable for the circuit conductors to ranges or water heaters.

The reason why it is sometimes commonly believed that service entrance cable should not be run within the concealed spaces of a combustible wall stems from the fine print note following Section 2331, which covers the introduction of unfused service conductors to buildings, but even in this note you will also find the provision that such service entrance conductors may be run concealed within a combustible wall if they are provided with overcurrent protection at their outer end.—G.R.

Hoist In a Hay Mow

Q. Below find details of an installation that I was called on to change. It was unsatisfactory to the owner and I believe does not comply with the Code.

Explanation:

This is an installation of an electric hoist that must travel on a trolley. It is installed in the haymow of a barn.

The hoist raises baled hay from the loading area in front of the barn to the door at the top of the barn and the hoist and its load is moved down the track to whatever area it is desired to unload, where it is lowered, unloaded and returned. The hoist is operated by a 110 volt supply connected by a 12-2 rubber cord cable suspended from the rear of the barn. It is plugged into an outlet and hangs down on a weighted pulley (at the bottom) and returns to the top through another pulley and then to the hoist. As the hoist is moved along the track, the weighted pulley keeps the cable tight between the hoist and the upper pulley.

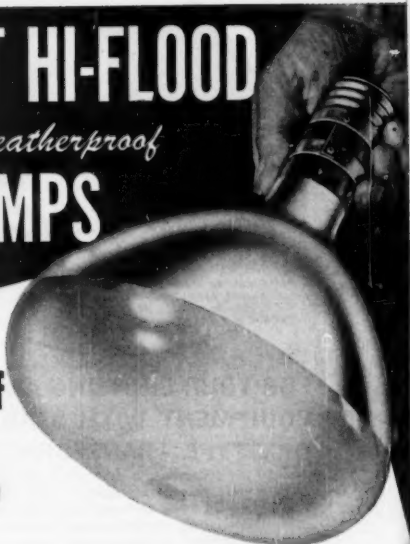
The control cable is suspended and operated in the same way. It has a control hanging loose which has up and down pushbuttons. The owner finds the system unsatisfactory and wants me to change the system to something that will operate more satisfactorily and still be safe. He thought of using bare contact conductors on each side of the trolley track. I am familiar with this system but can't decide as to the safety and compliance with the Code. Section 6122, Article 610 of the 1949 National Electrical Code Vol. 5 states that collectors may

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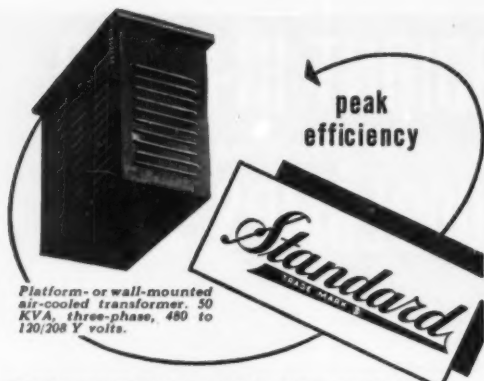
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be used in rooms used for the storage of easily ignitable combustible fibers and materials provided that Section 5083 is complied with. Section 5083 applies to class 3 Division 1 and 2. Would this apply to the barns used for the storage of baled hay? The hay is not dumped but lowered by hoist and handled by hand.

The question is, if I can't use this system to supply current to the hoist and control it, what kind of a system can be used? If this system can be used could you give me any suggestions for its installation? I would like any suggestions as to what sort of system would be permissible as well as satisfactory to the owner.—R.W.

A. According to your explanation the present method of serving and controlling the hoist involves the use of over 200 feet of cord, which certainly is subjected to mechanical abuse involved with the pulley and weighted arrangement, as well as the ordinary abuse usually common to barn occupancies. Section 4003 of the Code covers the use of flexible cords and while cords are recognized in the wiring of cranes and hoists, I feel safe in assuring you that the present cord application never was intended to be recognized by the Code and does present a fire hazard especially in this type of occupancy.

If the distance involved was not so great it might be possible to safely cover the application by the use of automatic take up reels which are recommended in Section 5083 of the Code. I do not believe this is the correct answer to your problem since the cords would be too long and they themselves would require frequent inspection and replacement in order to avoid a cord hazard.

Section 5006 defines a class 3 Hazardous Location and while hay is not specifically covered I believe there is no question about it being included in a class 3 Location. Section 5083 recognizes the use of cranes in a Class 3 Location provided several conditions are satisfied. One of the most important hazards concerns the arcing which occurs between the collector and the bare conductor wire. This hazard may be safeguarded, however, if the Code rule, calling for barriers so arranged to prevent any escape of sparks or hot particles, is satisfied. The need for an automatic ground detector is also important since any accumulation of dust and flyings on the insulators supporting the bare conductors may form a path to ground with sufficient current to ignite the fibers.

It appears to me if all of the requirements of Section 5083 are satisfied you will obtain an installation in accord with the N.E. Code.—B.A.McD.

Box Connectors

Q. Section 3004 requires that cable assemblies, such as cable entrance cable or non-metallic sheathed cable be mechanically secured to all metallic outlet boxes and cabinets. Connectors are therefore required.

In this particular installation I brought the S E C cable up the outside wall and drilled through a one inch wall thickness and into the back of the service switch which was mounted on the opposite side of the same wall. I used a watertight sill plate on the outside where cable entered wall and considered the cable properly supported without additional cable clamp at knockout in box. Please advise if this was a just objection or not.

I would like your interpretation of Article 3710, Paragraphs b & c, 1947 National Electrical Code, on conductors entering boxes and fittings. Does this mean that non-metallic sheathed cable and service entrance cable shall be secured with clamps or connectors to metal boxes, regardless of outside support and yet is not required to be clamped to non-metallic boxes if supported within 8 inches of the box?—R.C.O.

A. Section 3004 requires that cable assemblies, such as cable entrance cable or non-metallic sheathed cable be mechanically secured to all metallic outlet boxes and cabinets. Connectors are therefore required.

Non-metallic boxes are exempted from this requirement if the cables are strapped not more than 8 inches from the boxes.

In the case mentioned above, undoubtedly the cable was well supported mechanically but the inspector was correct in requiring that a cable clamp be used where the service entrance cable entered a metallic service switch cabinet.—F.N.M.S.

Circuits in a Flour Mill

Q. We are about to install a large number of new circuits and lighting fixtures in a flour mill here and are somewhat confused as to which portions of the mill may be considered Class 2, Group G, Division 2 and which shall be considered Division 1. For instance, can the spouting floor above the roll floor be considered a Division 2 location where the spouts are all of the all-metal type and second, can the roll floor, which contains nothing but modern fully enclosed mills, be considered a Division 2 location and



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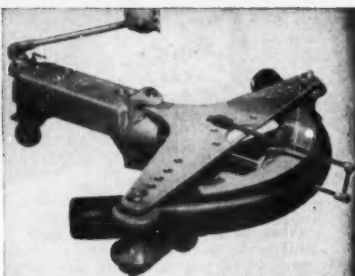
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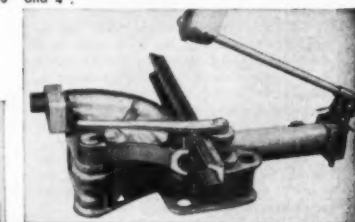


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third, can the sack warehouse for sacked flour be a Division 2 location? —A.P.B.

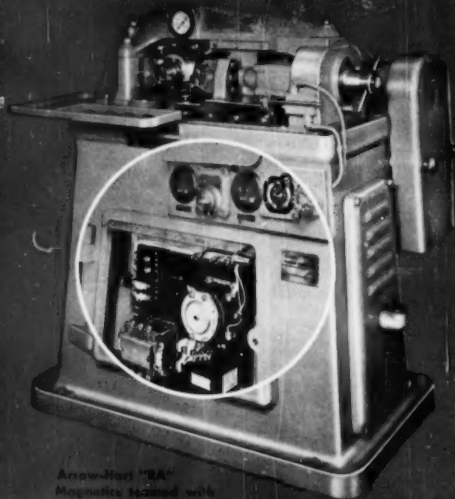
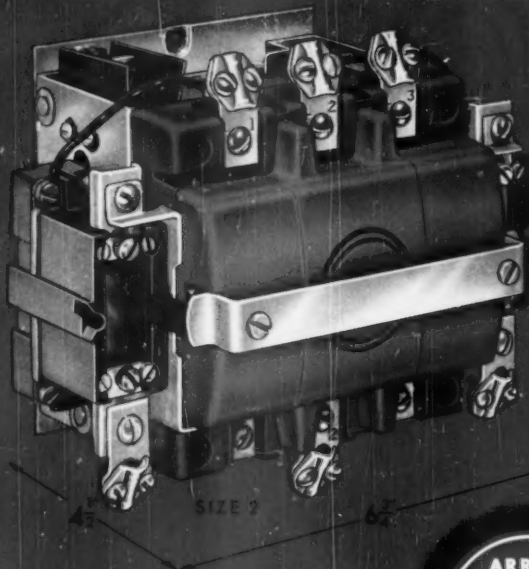
A. This is a question which really should be submitted to the Official Interpretations Committee of the National Electrical Code Committee as it is highly controversial. There are some who feel that a location should be considered as a Division 2 location only when an abnormal condition will bring about an explosive dust air or vapor or gas air mixture and that a Division 1 location shall be an area where an explosive mixture is likely to exist most of the time. It is my individual belief that an area shall be considered as either a hazardous area or a nonhazardous area due first to the fact there are relatively few instances in which a room or area contains an explosive mixture over any appreciable period of time regardless of the processes being conducted therein. I therefore would suggest that you treat the spout and roll floors as a Division 1 location and the sacked storage warehouse as a Division 2 location provided the warehouse used for the storage of sacks and sacked flour does not contain sack cleaning or filling equipment. On the roll floor you will find that the operators must open each roll periodically to sample its output, hence, even though the devices are completely enclosed, they do not remain so. On the spouting floor even all-metal spouting is subject to building vibration, natural wear and the possibility of mechanical injury so the frequency of dust clouds being formed is such that I for one, feel a Division 1 location here is fully warranted.—G.R.

Underground Services

Q. We are installing an increasing number of underground services in which we have always used individual type RR conductors in the past. Now that the cost of this material has increased, we would like, if possible, to utilize a bare copper wire as a neutral conductor provided the Code permits the bare copper to be buried directly in the ground. Will you please explain the Code ruling on this?—M.E.C.

A. Due to the fact that soils contain in many instances either acid or alkaline matter which may rapidly corrode bare copper conductors and on the other hand well drained sandy soil free of humus matter will have little or no effect upon bare copper, the question of whether or not

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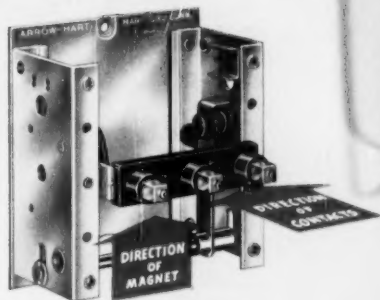
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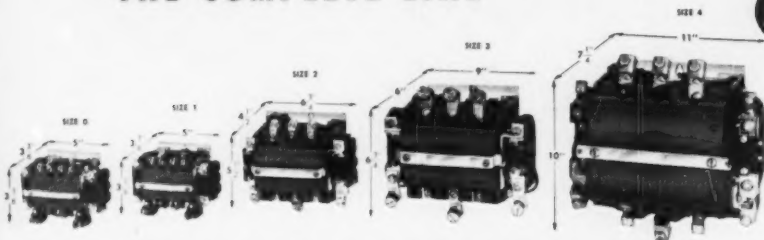


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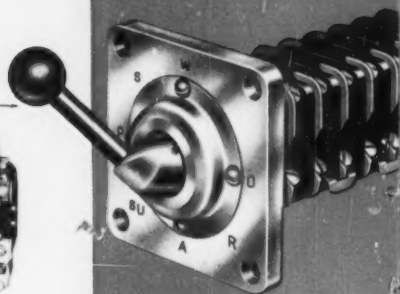
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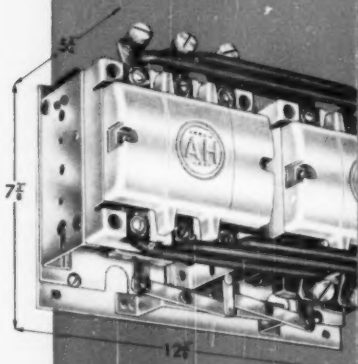
Provides full protection to operator, machine and work. Same features as A-H Magnetic Starters described on these pages. Positive mechanical interlock. Reverse contacts do not start to close until forward contacts are completely open. Switches are coupled by roller-type, free-floating linkage. Free-release transfer action.

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a bare neutral may be used as an underground feeder or service must be determined by the authority enforcing the Code in any specific instance due to these differences in soil conditions. In some areas it has been found advisable to require a soil analysis by a reputable agency before permitting the use of bare copper neutral conductors.

Since the introduction of polyethylene jacketed or neoprene insulated weather-proof type conductors, many contractors are using one or the other of these specially insulated conductors as the neutral conductor for underground runs. Either of these jackets is not affected by alkaline or acid conditions which may exist.—G.R.

Minimum Size Of Service

Q. Section 2304 A of the Code recognizes service entrance conductors as small as No. 12. Section 2594 A requires the grounding conductor of an alternating current system to be not less than No. 8. If I installed a No. 12—2 wire ac service would you insist that a No. 8 ground wire be used for grounding the secondary. If so, how do you justify the use of No. 8 wire in a part of the grounding circuit and No. 12 in the other part?—J.W.

A. Insofar as the N.E. Code is concerned it appears that an inspector would have to accept a No. 12 service and insist that it be grounded with a No. 8 conductor. He might, however, be justified where ac grounded systems are concerned, to insist on a minimum No. 8 service on the basis that if No. 8 is needed for grounding the system, it is also needed in any part of the grounded circuit. The 1951 supplemental revision of the N.E. Code under Section 2304 requires a minimum No. 8 service. If this is approved by the N.F.P.A. this apparent inconsistency will be remedied.—B.A.McD.

Official NEC Interpretations INTERPRETATION NO. 364

Issued August 22, 1950

Section 2453

Classifications. Type "S" Plug Fuses

QUESTION: Was it the intent of the Electrical Committee, when recognizing the Type S plug fuse and fuse-holder, as in the present texts of paragraphs a and b of section 2453, also to recognize as standard a subdivision of the 16-30 ampere classification so that, for example, fuses and fuse-holders including adapters rated 21-30 amperes could not be used in the place of those rated 16-20 amperes?

ANSWER: No.



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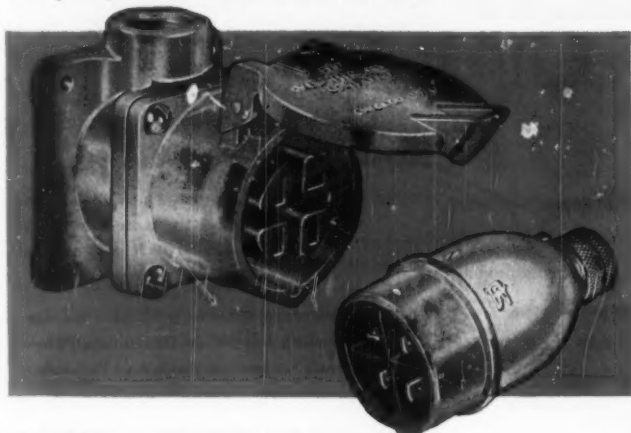
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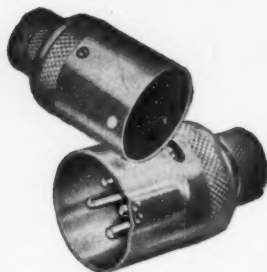
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Midget Triploc Series Same construction features as Triploc except for much smaller outside diameter of plug shell—only 1 1/4". Interchangeable and reversible contact units—2, 3 and 4 pole—are of the flat blade type. Rated 10 amperes, 250 volts; 15 amperes, 125 volts.



Fusible Plug



Fuseless Plug

3-Gang Receptacle

General Purpose Series Available with cast metal housings in many types for circuit breaking and disconnect service. 30 amperes, 125 volts DC, 250 volt AC—1, 2, 3, 4, 5 and 6 pole. 60 amperes, 250 and 600 volts—3, 4 and 5 pole. 100 ampere, 250 and 600 volts—2, 3 and 4 pole. Also many special types, fusible and fuseless, for varied applications.

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Industrial Electrification

Electrical Recording Instruments—Part IV

Helpful suggestions on selection, care, maintenance and operation of electrical recording instruments.

THE selection of a meter depends upon the type of machinery or condition involved and the test to be made. When a person selects either an ammeter, wattmeter, voltmeter, pressure recorder, milliammeter, power factor recorder, or any of the other types of recording instruments, he must first know what he is going to do. For instance: In plant survey work the instruments generally used are, in the order of their importance, graphic wattmeter, voltmeters, ammeters, and power factor meters.

A review of the voltage, current, and power ratings of all electrical equipment for industrial plants requiring tests and investigations is important. This will enable the engineer to select recorders having suitable ranges for measuring the electrical characteristics of each piece of apparatus individually; also for checking the entire plant load when required.

If a plant has 115-volt lighting, 220-volt single-phase power, and 440-volt 3-phase power, a wise choice and purchase would be a recording voltmeter having a range of 150/300/600 volts. This same instrument could then be used for all voltages and eliminate the purchase of a separate recorder for each.

Electrical instruments should be selected with definite ideas regarding their future operation and application as well as their present uses. They should not become obsolete with plant expansion and growth. If an instrument is to be used in various parts of the plant, it would be foolish to attempt to use anything but a portable instrument. By the same token, if the instrument is to be mounted permanently, the appropriate type of switchboard or wall mounting case should be selected.

We have pointed out in this series of articles that good management requires factual data and information prior to the solving of industrial problems. The securing of facts is just as important when it comes to the selection of instruments. The field men or

By Chester M. Poor
Application Engineer
The Esterline-Angus Company, Inc.
Indianapolis, Indiana

agents of instrument manufacturers are thoroughly familiar with their products. They have vast knowledge of previous problems; a wonderful store of experience from which to make recommendations for specific instruments; and their recommendations are made on hard facts applicable to the particular problem at hand. Therefore, the wise plant manager or electrical superintendent consults an instrument man concerning his instrumentation problems.

When it comes to the final selection of an instrument, the following questions should be applied.

1. *What is the nature of the measurement?* Is it amperes, volts, frequency, pressure, power factor, etc.?
2. *What type of case will be required?* Will it be portable, flush mounting or surface mounting?

3. *What is the source of current?* Is it ac or dc?

4. *What scale is required?* What range will be required?

5. *What chart speeds are needed?* What is the rapidity of the fluctuation in the quantity to be recorded?

6. *Will it require transformers, shunts, or multipliers?*

Maintenance Hints

Electrical recording instruments, while rugged and constructed primarily for industrial use, are precision devices. The chart drives and measuring elements are inherently rather complicated mechanisms and should be handled with some knowledge and understanding of their characteristics. These parts cannot be permanently sealed since the user must have access to insert new charts, insert ink, and wind the clock. Since he must perform these duties, there are certain basic requirements to follow and certain bits of knowledge which will enable him to treat the device with the respect that is due a precision mechanism.



FIG. 17—Instruments used by an electrical contractor for making industrial plant surveys include graphic wattmeter; voltmeter; clip-on ammeter and instrument transformers.

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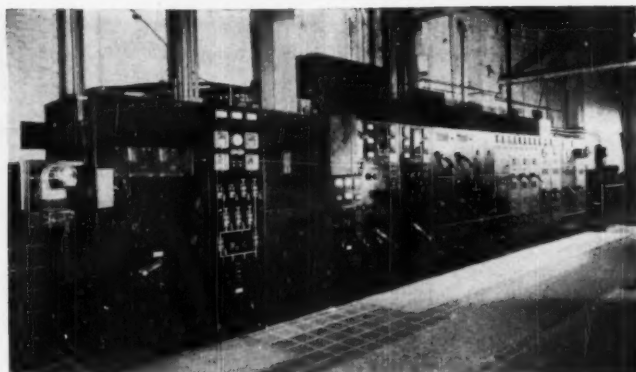


FIG. 18—Recording type instruments are among those found on modern electrical distribution switchboards.

Instruments of the remote future may have a burglar-proof case which will defy those peculiar individuals (there is at least one in every plant) who can never resist the temptation to see if he can make it work better. These instruments will have efficient air filters which will remove all dust, scale, and moisture; the writing element will never require a refill of ink; and the oilless gears and bearings will run silently and smoothly, forever without wear, and without requiring lubrication. However, we must face the present, and discuss the manner of keeping present-day recording meters operating as the manufacturer intended.

Should the maintenance man or engineer need to select additional personnel to make instrument surveys, there are several factors which should be considered in this choice. If at all possible, that person should have some knowledge of plant processes, electric circuits and equipment, and should possess an even temper and a sense of humor. In the absence of a record based on experience, the plant operator would do well to search out an individual who has hobbies of a certain nature. A radio amateur, a model train enthusiast, or a "tinkerer" who puts workable gadgets on his furnace at home, are all good possibilities.

Larger plants will have the facilities and equipment for the maintenance and care of instruments and, as a result, will be able to train men specifically in these duties. However, the smaller plants, if they follow the general ideas of the previous suggestions will be able to accomplish the required job.

Care of the Instrument

Care should start as soon as the instrument is received. A record should be made of all essential data such as serial numbers, calibration, type of

case, type of drive, etc. There are numerous methods of keeping this record, but it should be set up so that all future repairs or checks on the instrument may be noted and retained as a complete unit.

For permanently mounted meters, the record should cover the date of installation, the person responsible for the mounting, the types of transformers, shunts, or multipliers and their serial numbers, and all other pertinent data relative to the installation.

For portable meters, the record should cover, for each time of use, the location of the meter, its date of installation, the person responsible for its use, the accessories used with it, the circuit or machine tested, and the date that it was returned to storage.

As long as the instrument is in use, the inking system should be inspected periodically. Most manufacturers recommend once a week. Fresh ink should be added to the inkwell; any dirt, lint or dried ink should be removed from the pen point, and some ink should be drawn through the pen element.

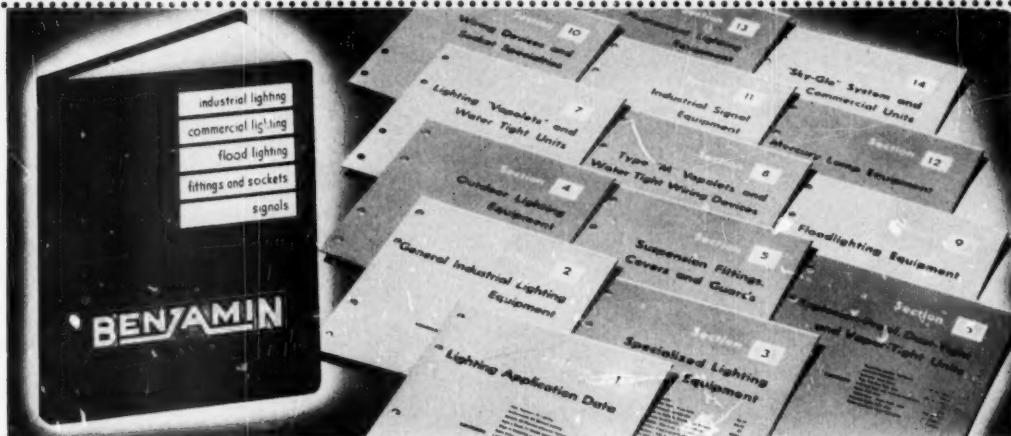
At least once a month, the inkwell and pen element should be emptied, washed and refilled.

Intermittent writing, failure of the pen to write on sudden swings, or a tendency of the ink to spread on the paper and produce a broad, fuzzy line, are all indications that the ink in the inkwell has thickened and oxidized and that the inking system should be serviced more often.

The inkwell should be emptied or removed before moving an instrument. When putting ink in the inkwell, care should be taken that ink is not spilled on any part of the instrument mechanism. Spilled ink will cause deterioration of insulation, and corrosion of metal parts.

With ordinary care, the chart drive mechanism and the measuring element should, if given good maintenance

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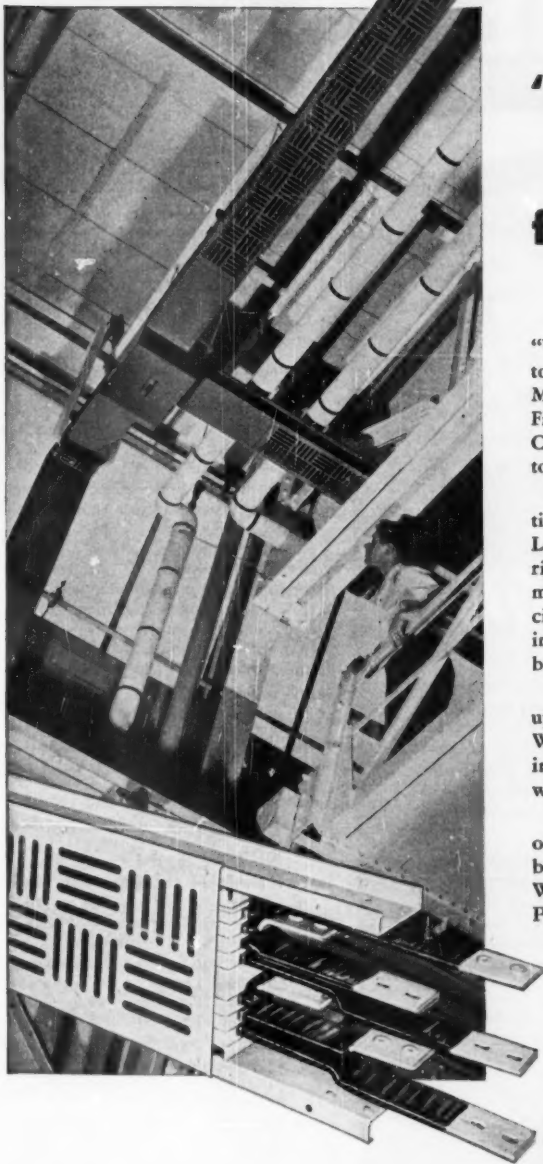
FIG. 19—Storage shelves for electrical instruments, both indicating and recording types, should be in clean, dry area free from vibration.

such as occasional cleaning and oiling, operate many years without need of repairs. The chart drive should be oiled about every 6 months with clock oil. Ordinary lubricating oil is not at all applicable for this purpose. It is not necessary to "drown" the bearings of the clock mechanism. Most instrument manufacturers furnish an oil for this purpose which is put up in small bottles and it is necessary to only dip a small wire in the oil and then touch it to the bearings. All excess oil should be carefully removed.

The better recording instruments have been designed so that they will stand up under severe use without suffering damage. If, due to accident or misuse, the instrument should require repairing, the repair often can be made by merely replacing the damaged part. Pen elements, clock escapements, spring barrels, clock springs and synchronous motors usually are removable and interchangeable and can be quickly replaced. For example: in the past, if a small part in the clock needed attention, it was necessary to remove the entire instrument, or at least the whole clock, thus putting the instrument out of operation for the time. Now, if an escapement needs cleaning or repairing, the unit can be quickly removed and replaced with another, without the necessity of removing the meter.

Wherever a number of recording instruments are in service, a few spare parts should be on hand for proper maintenance. However, it is a general rule of instrument manufacturers to supply a list of recommended spare parts whenever an instrument is ordered. Most of the spare parts recommended are items of short life or items which are easily broken. "Cannibalization" or borrowing of parts from another instrument is sometimes necessary, but in the end has the effect

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FIG. 20—Meter calibration of both indicating and recording types should be checked at regular intervals with standard unit. Unless adequate facilities and personnel are available in the plant, this should be done by the manufacturer.

of making two repair jobs instead of one.

Elaborate repairs should not be attempted by the average maintenance man. Instead, the instrument should be returned to the manufacturer. A few larger utilities or industrial concerns have well equipped repair and standardizing laboratories, and skilled instrument mechanics, and hence do their own repair work. Most instrument users will find it more satisfactory and more economical in the long run not to attempt such major repairs, but to have these carried out by the manufacturer instead.

Operating Hints

A general list of operating hints for electrical recorders would read as follows:

Portable Instruments

1. Upon receipt of the recording meter make a record of all the essential data. If a standard meter is available, check the calibration.
2. Observe care in handling in order to have continuous service with a high degree of accuracy.
3. When setting up an instrument for use, choose a clean, well-lighted location free from vibration and dirt.
4. When storing an instrument, choose a place free from dirt, corrosive fumes, oil, heat, moisture, or excess vibration.
5. Place the instrument as near as possible to the apparatus being checked. Be sure to keep in mind stray fields.
6. Use insulated wire of sufficient size to carry the current.
7. Make connections as short as possible.

America's Road to Victory

... Let's Increase Production

This is the time to speak out—now—at the beginning.

Our industrial program for re-armament is getting off on the wrong foot.

The talking and writing about it emphasize the wrong things.

Its headline words are "cuts" and "controls."

Those words make bad propaganda for the cold war.

"Cuts" and "controls" are no words to challenge the imagination and energy of our own people. They won't impress the masters of the Kremlin. And they can only make it appear to the rest of the world that America thinks it can defend the free way of life by abandoning it.

America stands as the world's champion against aggression because America has become the most powerful free nation in the world.

How did we get that way?

Not by putting ceilings on wages; not by rationing or clamping iron-clad government controls all over business and industry.

To be sure, some temporary controls are necessary to channel very scarce materials speedily to use for defense. So, too, are special taxes and credit restrictions needed to combat inflation. But they will be fatal if they blind us to this fact:

We became the strongest nation in the world by out-producing every other nation.

Production—The Final Answer

Next year our government is planning at least a \$40 billion military program. Instead of planning only on controls to divert \$40 billion of production from the making of civilian goods to the making of military supplies, we should be figuring out also ways to push up total production.

Of course, our industrial plant is running at close to "capacity" now. And our labor force has reached almost full employment. There isn't much slack to be taken up.

Can even the United States add a \$40 billion miracle of production on top of what it is already doing?

Our answer is "Yes"—and within two years. It can be done by adding about \$6 billion each year to our program of capital investment which now runs about \$22 billion a year.

Part of this added production will come from expanding our industries. The steel companies, for example, already have plans to increase their capacity almost ten per cent in the next two years.

But by far the largest part of that \$40 billion of added production must come from higher productivity—raising industry's efficiency.

continued on next page

To meet our goals we need to raise our productivity five per cent a year.

Can it be done?

The answer is an emphatic "Yes."

Raise Industry's Productivity

McGraw-Hill's studies of industry's equipment show that there are countless opportunities for improving efficiency. Our manufacturing industries alone need at least \$35 billion of new equipment to raise their facilities to first class technical standards.

Here are some of the broad possibilities reported by the trained editors of McGraw-Hill's business magazines:

In many manufacturing plants as much as 40 per cent of workers' time goes into moving materials and parts—shifting things about within the plant between processes and to and from shipping platforms.

FACTORY estimates that improved materials handling equipment and methods might well cut handling costs twenty-five per cent and save annually over 650,000 man-years of unnecessary labor.

Modern machine tools designed since World War II are 40 per cent more productive, on the average, than is old equipment. But *AMERICAN MACHINIST* surveys show that 95 per cent of industry's machine tools are of designs at least ten years old. Replacing them could raise productivity of the metalworking industries at least ten per cent—enough to absorb a major share of the metalworking industries' part of the defense program as now planned.

In coal mining, latest equipment and methods can raise productivity sharply. The editors of *COAL AGE* estimate that production of bituminous coal could be raised from seven tons per man-shift to ten within three to five years.

Many new textile production techniques are 50 per cent to 75 per cent more efficient than those in use now. If plants could be fully modernized, and full use made of latest management methods, *TEXTILE WORLD* estimates that output-per-manhour would rise 20 per cent. A *FOOD INDUSTRIES* study indicates that modern equipment plus the best management techniques could raise productivity in food processing at least 20 per cent.

These are just some of the opportunities that industry can seize and by which the nation can profit.

A Nation-Wide Effort

Of course, industry itself can't do the whole job. Labor, government and all the rest of us must cooperate.

Government's part is to see that its emergency controls are so applied that they will increase productivity and thus make possible an early lifting of such controls.

Labor's part is to help in the development of labor-saving methods and machinery and to welcome their adoption as the only sure way of continuing to advance the American standard of living while maintaining the American free way of life.

For all of us the job is to work constantly for an expanding, ever-stronger America with constantly growing productivity; not a pinched and shackled America cooped up under wage and price ceilings and tied to a ration card.

Challenge to Industry

Here is a sharp challenge to industry to study the best work-methods that are being reported—to use every minute and every dollar it can to replace obsolete equipment.

Here is a sharp challenge to government to do everything within its power to make its control policies and its fiscal policies strengthen the incentives to industrial modernization—to demand sacrifice for a purpose and not-for effect.

The job to which such opportunities point will take time—though nothing holds back adoption of some of the simpler improvements in work-methods reported in business magazines all the time.

But increasing production is our one best hope that we may be spared the full array of price, wage and production controls now and be freed eventually from all controls.

General Omar Bradley has said that the protection of our national independence calls for "long-range commitments that we are willing to carry out."

A long-range commitment to fight this battle for peace with America's most powerful weapon—industrial productivity—is the surest guarantee of victory for the free world.

Let's make that commitment—now—at the beginning.

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SCREW ON
—like a nut
on a bolt!



**faster—safer
wire joints —
without TOOLS,
Solder or Tape!**

APPROVED FOR ALL TYPES OF BRANCH CIRCUIT WIRING

Why bother with special tools, solder or tape, when you can make strong, safe wire joints easier and faster with IDEAL "Wire-Nuts"? Actual surveys show that more contractors prefer IDEAL "Wire-Nuts" than any other method of making wire joints. This is why: . . . "Wire-Nuts" are faster—just screw them on—like a nut on a bolt. "Wire-Nuts" are safer—sharp wire ends are covered and fully insulated. "Wire-Nuts" are stronger—have precision-built spring inserts that are checked and tested to .001 tolerances. "Wire-Nuts" are more dependable—shake-proof, permanent. Average cost is only one cent per joint! Use them for all types of branch circuit wiring—conduit—armored cable—non-metallic sheathed cable and open wiring. Make sure you get genuine IDEAL "Wire-Nuts". Two contractor sizes—Nos. 74B and 76B—listed by Underwriters' Laboratories, Inc. as "Pressure Cable Connectors"—suitable for all types of branch circuit wiring.

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8 TIMES FASTER**



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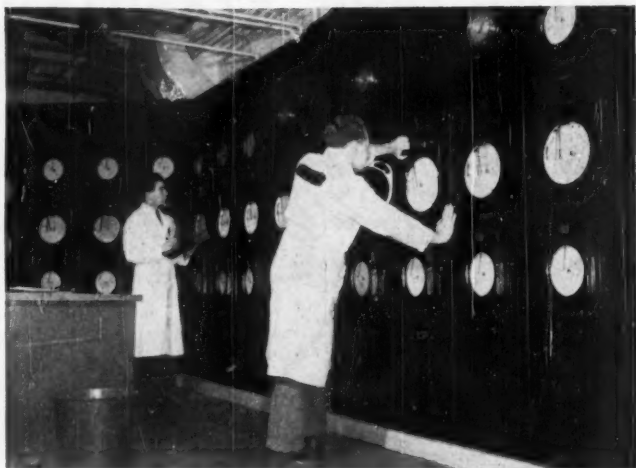


FIG. 21—Circular chart recorders in panelboard mounting in temperature and pressure control room of a synthetic rubber plant. Engineer at right is setting reaction temperature for a new batch of material.

8. Place the instrument in a location where it is easy to see and manipulate, but where it is not likely to be damaged. Use a solid table or a large box. *Avoid placing the instrument on the floor.*
9. Make a diagram of the connection before actually making connections.
10. Check to see that the polarity of the connections is correct.
11. Make sure the writing pen is on zero when the circuit is open.
12. See that the circuit is amply protected by an overload device or else stand ready to clear the circuit if necessary.

Permanently Mounted Instruments

1. Upon receipt of the recording meter make a record of all the essential data. If a standard meter is available, check the calibration.
2. When mounting the instrument, make sure that all connections are made securely and according to connection diagram.
3. Make sure that all holding studs and bolts are tight.
4. Make sure the target of the writing element is on zero when the circuit is opened.
5. When making two or more connections to the same current transformer, always connect their current coils in series.

Many of the rules given for portable instruments are applicable to the permanently mounted instruments, and have not been repeated.

The applications of recording instruments are increasing constantly and the uses are too numerous and varied to permit describing in full de-

tail. However, the most common usage today is in plant surveys. Assume that the plant manager is starting to build up his recording instrument equipment by first purchasing the instruments necessary for this type of work.

Instruments of help in surveys are portable wattmeters, voltmeters, ammeters, and power factor meters. The voltmeter is used to check the voltage drop in the line and to see that lamps and motors are operating at their proper voltage. The ammeter is very useful in determining the loading of transformers, equalization of phases, the current in feeders, and in setting circuit breakers and determining fuse sizes. The power factor meter is useful in running surveys where large motors are employed.

In this series of articles, we have endeavored to create a better understanding of recording instruments, their use, and care. With proper maintenance, electrical recorders can be valuable assets to plant operation. They record the measurements over a period of time and provide a means of a systematic analysis of power applications, power use, operating loads and production schedules. They usually disclose shortcomings and oversights on the part of man and management, and the possibilities of improvement in the operation of equipment and assigning of schedules.

Test do not correct conditions. They only furnish information. Careful analysis of test data can uncover operating irregularities and equipment deficiencies. Application of corrective measures can lead the way to cost reduction and increased plant efficiency.



Unretouched photograph of the Quincy School, Dedham, Mass.
Electrical Contractor: Robert L. Tibbets, Dedham. Area: 804.5 square feet. Fixture Mounting Height: 10'-0". Fixture spacing: 10'-0". Fixtures: 9- No. 6628 pendant mounted, with 2-T1296 Standard Warm White Slimline lamps each. Watts per fixture: 177. Watts per square foot: 1.98.

Room Finish: Cream yellow upper walls; olive green paint on chalkboards, using yellow chalk; dark varnished woodwork; scrubbed pine floors @ approx. 20% reflection factor. Readings at desk level: (20"-21" from floor), Average, 51.7 Footcandles initially. Vertical Readings on chalkboards: 28 Footcandles average.

The "LIGHT" Touch is the Right Touch to get Brighter Students

A pioneer in the use of fluorescent fixtures in the schoolroom, Dr. Calvin E. Wilcox, Superintendent of Schools in Dedham, Mass., believes that better lighting means brighter pupils. And since 1941 he has been modernizing seeing conditions in all his schools.

Typical is this installation of Lite-control's newest, smartest Slimline fixture in the recently relighted Quincy school. Note the excellent illumination throughout the room — the even lighting of the chalkboards — the well

lighted ceiling with only moderate contrast — the unusually good end throw from the unit. Not shown, but important, is the 86% efficiency.

If you are planning a relighting job for schoolroom, office or showroom, we'd like to tell you more about this latest Litecontrol fixture.






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PLUS installation time 

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are proportional to the weight  of materials used.

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Therefore you can use smaller—lighter cable 
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cut $\frac{1}{3}$ and installation MANHOURS 
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*National
Electric Code—
Chapter 10



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In the News

Industry Controls Expand and Tighten

A Washington Roundup of defense production controls and regulations reveals more and tougher controls over a wide range of materials and non-military production are now in the making.

MORE and tougher industry controls have been issued by the National Production Authority. And indications point to even more and ever tougher controls in the next few months ahead. Complete control by government over all uses of steel, aluminum, and copper is now predicted by late spring or summer, by the men in NPA with authority over these and other critical materials.

Lest we become confused over mobilization and defense production plans and objectives, due to political discussions and maneuverings both in and out of United Nations, it is well to review and keep in mind these plans and objectives. The Defense Production Act of 1950, authorized by Congress and approved by President Truman in mid-summer, 1950, has now been in effect over five months. Passed at a time of dire emergency due to the Korean situation as it existed at that time, DPA gave the President full power to take almost any action found necessary and appropriate to promote the national defense. Specifically, it granted the President power to requisition materials and plants necessary to the rearmament program, and to allocate goods in short supply to defense production. It further provided that money may be advanced to plants in order to increase industrial capacity and to speed up production. It also gave the President power to check inflation, including the imposition of wage and price controls, rationing and credit controls.

In carrying out the terms of DPA of 1950, President Truman passed on the powers delegated to him to the National Security Resources Board and to various federal agencies (EC&M, October 1950, p. 161). Secretary of Commerce Charles Sawyer was delegated powers of allocation, priority and requisitioning over many of the key materials and commodities of our economy, who immediately established the National Production Authority within the Department of Commerce framework to administer and

carry out the terms of these powers. It is the NPA controls and regulations which primarily affect the electrical construction and maintenance industries.

Defense Plans

Aims and objectives of official Washington have been, and still are, to superimpose on our national economy a military defense and production program, with as little hardship as possible on the civilian economy. Defense spending has been under way for some time, but the fulfillment of defense orders is only now beginning to be felt by industry. Pre-Korea defense spending was at an annual \$14-billion rate. This has now been stepped up to some \$40-billion, or about \$3.5 billion a month. Previous plans were to boost this to about \$5 billion a month by mid-1952. These plans have now been discarded in favor of a lower production rate over a longer period of time. Even so, the materials used most in military production are the materials used most by industry in its normal production of civilian goods. Military production must come first, and single-band "DO ratings" are being used to see that it does. But as steel, copper, aluminum, tin, zinc, and other metals become short in supply, it is already apparent that "DO ratings" only are not adequate. Thus the conservation type orders, end-use orders and controls, credit curbs, etc., are also being used to implement the present military spending program—and to curb inflation.

NPA Questionnaires

Present controls are already being labeled "temporary" by officials at NPA. And in order to obtain a more factual picture of materials shortages, NPA has already asked about 8,000 companies who have metal-fabricating shops for detailed figures on their use of aluminum, copper, steel, and magnesium, and for records of shipment of products. Information obtained by the NPA questionnaires will be used

as a basis for planning tighter controls over materials during the months ahead. Some eight or more other questionnaires are also being worked up by NPA, devised to provide factual information on other metals and products now found to be in short supply.

Electrical Products

The electrical construction and maintenance industries now have, in effect, specific representation in the National Production Authority. This representation is in the form of a new department, the ELECTRICAL PRODUCTS SECTION, set up within a newly-created Building Materials Division of NPA. Another department also in the making is a LIGHTING & FIXTURES SECTION, also within the same Division.

John L. Haynes, who has headed up the Construction Division of NPA since early October when it was first organized, has been appointed Director of the newly-organized Building Materials Division. Having served as Director of the Building Materials Division of the War Production Board during World War II, and as Chief of the Construction Division, Office of Domestic Commerce, U. S. Department of Commerce during the postwar years, Mr. Haynes is entirely familiar with the operations and problems of the building and construction and electrical construction and maintenance industries, and is exceptionally well qualified to represent these industries at NPA on materials, controls and regulations, and on problems of priorities and allocation.

Luther D. Shank, with an exceptionally good industry background, has been appointed chief of the newly-organized ELECTRICAL PRODUCTS SECTION. He comes to this job from the Appleton Electric Company, where he has served as District Manager of the Philadelphia, Pa., area during postwar years. During War II he served over three years as Deputy Chief of the Electrical Products Section of the Building Materials

ENTRANCE CAPS AND FITTINGS of Rustproof Cast Aluminum Alloy by AUSTIN

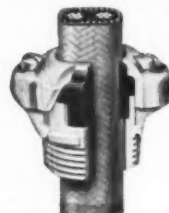


No. 1572 Entrance Head.
Key-hole mounting bracket for easy attachment to building.

No. 275 One Hole Strap
for oval-shaped cable.



No. 275 Two Hole Strap
for oval-shaped cable.



No. 50-36 Watertight Connector.
Cutaway view illustrates how 3-point compression forces rubber gland around entire circumference of cable.



No. GR-1 Grounding Ring.
For bonding meter box to artificial ground. Tight connection and positive bond without soldering.

No. 6009

Non-watertight Connector. Takes a wide range of sizes and types of cable, round or oval, without the use of shims or inserts.



No. L-63

Sill Plate Provides metallic protection to service entrance cable at the most hazardous point—where it enters the building.



SOLD THROUGH ELECTRICAL WHOLESALERS

The M. B. Austin Company
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Division, WPB, and ended up this post as Acting Chief of the Section. Previous to War II he was an electrical contractor, and at one time an electrical inspector. He is thus entirely familiar with the problems of the electrical construction industry, both in peacetime, and during emergency periods such as the industry is now facing.

Building Construction

A forecast of new building construction for 1951, made early in November as a result of meetings between two industry advisory committees and NPA, was for a drop of about 17.5 percent below 1950. Private residential construction was predicted to fall 46 percent. Increases were predicted in industrial building, farm and public utilities construction, and public building. These increases will not make up the difference over this year's total, however, according to the forecast.

More recent estimates, based on shortages of copper, steel and other metals (copper for electrical wiring, for example), and on the strong possibility of a much tighter amended Construction Controls order (NPA order M-4) by mid-1951 or sooner, indicate total building construction will most likely fall even lower as compared with the 1950 record. Emphasis will be placed on continued industrial plant expansion during 1951 and 1952, however, with both financial and priorities aid for war plants, when needed. Washington officials indicate.

Notwithstanding the much-publicized and so-called "about face" of NPA Administrator Wm. H. Harrison, regarding his clarification of Construction Controls order M-4 following criticism from the Associated General Contractors of America, the order still stands with practically the same controls as originally intended. Non-essential building construction of places of amusement and recreation are still prohibited. And if new information on shortages of critical materials at any time shows the defense program is being slowed down due to use of these critical materials in non-industrial construction, much more severe restrictions on all but industrial building may be expected.

Controls on Metals

NPA Order M-7, Use of Aluminum, was issued November 13, 1950. It is a conservation type order, designed to provide the necessary quantities of aluminum for the rearmament effort, and for equitable distribution among all users of the aluminum available after defense requirements are met. It states that "users of aluminum may not use for non-defense purposes within

each quarter (beginning Jan. 1, 1951) more than 65 percent of the average quarterly use of aluminum during the first six months of 1950." The order contains some exemptions, such as "conductors for electric utility use until April 1, 1951, providing that it had already been ordered."

A similar end-use limitation order on copper is in preparation and expected shortly, based on a "cut-back" in use of copper by fabricators of products using copper. Extent of cut-back has been indicated to be less than that on aluminum, but any substantial increase in demand for copper in defense production could up the percentage.

Controlled Materials Plan

NPA officials are now convinced that the size of the military program, imposed on top of a tight civilian economy, will eventually force a "Controlled Materials Plan" (CMP), very similar to the one put into effect by the War Production Board during World War II, to be adopted. This would place the government in complete control over all uses of steel, aluminum, and copper. A CMP would wrap up in one bundle 1) ban on non-essential uses, and 2) allocation of critical materials for military and essential civilian uses. It would require, however, that the government allocators have a complete picture of the end-products and requirements of both the military and civilian economy for each of the critical materials, and that these requirements be translated into quantity and quality of each component by shape, size, quality, etc. Questionnaires now out or in preparation will provide information in this direction.

NEMA Elects

C. W. Higbee President

The National Electrical Manufacturers Association held its 24th annual meeting at Haddon Hall, Atlantic City, N. J., November 13-16.

C. W. Higbee, manager, electrical wire and cable department, United States Rubber Company, New York, was elected president. He succeeds Charles T. Lawson, a vice president of the Kelvinator division of Nash-Kelvinator Corporation, Detroit.

The following vice presidents were elected: Arthur A. Berard, president, Ward Leonard Electric Co.; J. H. Jewell, vice president, Westinghouse Electric Corporation; J. F. Lincoln, president, The Lincoln Electric Co.; R. E. Murphy, vice president in charge of sales, I-T-E Circuit Breaker Co.; and Alan F. Sheldon, vice president and general manager, Kennebec Wire

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3. IN RECEPTION ROOMS! Walls, fabrics—even receptionists—look better under the full-color light from General Electric's new fluorescent lamps. And there is a choice of warm atmosphere or cool.



4. IN EMPLOYEES' LOUNGES! Here's a new trick decorators are using—G-E Deluxe White fluorescent lamps to add new beauty to social environments. Use them in employees' lounges to help improve morale.



5. IN OFFICES! Offices look better and are more pleasant to work in when they're lighted by the new fluorescent lamps. Employees, customers, visitors will all like the way the new light flatters complexions and clothes.



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GENERAL ELECTRIC'S two new Deluxe White fluorescent lamps contain a phosphor which gives practically perfect color rendition—something never before possible with fluorescent lamps. Deluxe Cool White creates a cool, efficient atmosphere; Deluxe Warm White gives a warm, intimate effect. For full information write Lamp Department, General Electric, Nela Park, Cleveland 12, Ohio.



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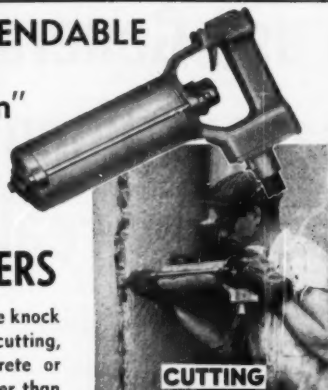
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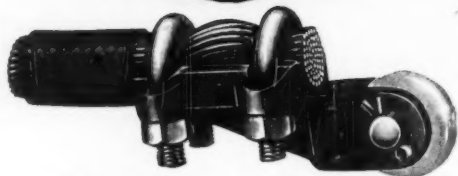


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... withstands direct pull of 17,000 pounds!

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C. W. HIGBEE, newly-elected president of NEMA.

& Cable Company. L. G. Hall, president, Stackpole Carbon Company, St. Marys, Pa., was chosen treasurer.

Population trends, extension of power lines, new product development and better wiring all point to a vast and continuing expansion of the electrical industry over a long period of time, according to Charles T. Lawson, president of NEMA. In his address at a luncheon session he said that competition linked with cooperation through NEMA would enhance the contribution the electrical industry can make to better living and to a better America in the days ahead.

According to industry trends, Lawson said the great potential of the electrical industry by 1960 could mean national public utility generating capacity nearly double today's figure of 69,000,000 kilowatt hours, and average home consumption more than double today's figure of 1,700 kilowatt hours.

Eight men were awarded certificates on November 14, in recognition of 50 years of continuous service in the electrical manufacturing industry. They were John W. Brooks, vice president and treasurer, Pass and Seymour, Inc.; Caxton Brown, chairman of the executive committee, Weston Electrical Instrumentation Corp.; George A. Burnham, consulting engineer, Allis-Chalmers Mfg. Co.; Dawson J. Burns, chairman of the executive committee, Ward Leonard Electric Co.; Max McGraw, president, McGraw Electric Co.; D. Hayes Murphy, president, The Wiremold Co.; Worthington F. Parker, president, The Standard Transformer Co.; and Edward F. Weston, chairman of the Board, Weston Electrical Instrumentation Corp.

Frank Thornton, Jr., engineering manager, Association Activities, Westinghouse Electric Corporation, received the James H. McGraw Award

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All Bryant 3-wire grounding devices rated 15 amperes 125 volts.

3-WIRE CONVENIENCE OUTLETS



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NO. 5262-I
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NO. 5261
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NO. 5260
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3-WIRE CAPS

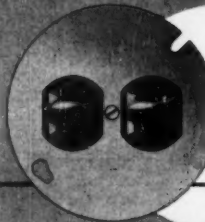


NO. 5264
NO. 5265
Armored with
Cord Grip



NO. 5263
Brown Bakelite
NO. 5263-I
Ivory Bakelite

BOX MOUNTING OUTLETS

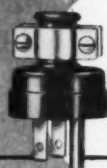


NO. 5282
Duplex, Brown
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Single, Brown

3-WIRE CAPS



NO. 5274
Black Rubber



NO. 5276
Black Rubber
with Cord Grip

3-WIRE CORD CONNECTOR BODIES



NO. 5269
NO. 5270
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FRANK THORNTON, JR., receiving the James H. McGraw Award Manufacturers Medal from W. T. Stuart, secretary, Committee of Awards.

Manufacturers Medal for 1950. Presentation was made by W. T. Stuart, editor of *Electrical Construction and Maintenance* and secretary of the Committee of Awards, at a luncheon held on November 15.

Mr. Thornton received the award in recognition of his distinguished contribution to the advancement of the electrical industry in the field of standardization, code development and safety regulations.

The panel of judges who recommended Mr. Thornton for this honor consisted of G. C. Thomas, Jr., The Thomas and Betts Company, Inc., H. A. Hudson, Wagner Electric Corporation, R. C. Sogge, General Electric Company, R. L. White, Landers, Frary and Clark, and W. T. Stuart for the Committee of Awards.

Industrial Electric Maintenance Show

Nearly 2000 electrical maintenance engineers, contractors and other industrial plant executives registered for the three-day Second Annual Tri-State Industrial Electric Exposition, held in Pittsburgh, Pa., October 24, 25 and 26. Sponsored by the Electric League of Western Pennsylvania, this exposition included a series of conferences with nationally recognized maintenance engineers and experts as speakers, and 42 exhibits of the latest developments in electric equipment and supplies.

The exposition opened with a kick-off luncheon at which J. C. Freeman, of Allis-Chalmers Mfg. Co., Milwaukee, was guest speaker. Taking as his topic a subject of vital national importance, "This is our America", he said "Americans from all walks of life (who) have been traveling throughout the world... have returned firmly convinced that the American Way of Life has more to offer than any other economic system."

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FOR ALL REPLACEMENTS STANDARDIZE ON THE *Elay* MOTOR STARTING SWITCH



INSTANT START... LONG LIFE...DEPENDABILITY!

For single phase, split phase, or capacitor fractional hp single or dual voltage motors.

FROM 1/6 TO 1/3 H.P. INCL., 50/60 CYCLES

FITCH *Elay* ALLEN
Write to Dept. E for
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**FITCH, ALLEN
AND COMPANY**

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CHICAGO 31, ILLINOIS

Designed for Contractors by Wakefield

Continuous Wire-Way

...simplifies every installation

Whether the job calls for a short fixture or a long continuous row—wiring takes a minimum of time because wireways are open all the way from one end plate to the other. The electrician simply feeds the wires through—and makes the connections, for each unit. Note also the wire clips that hold luminaire and feed wires up in the top of the channel, to provide a safer and a neater job.

It's just another part of Wakefield's Design For Contractors—for speedy one-man installation that saves time, saves labor and saves your customer money on every job. And each step is just as well-planned; just as easy—as we'll show you in future ads.

Wide-awake contractors don't say, "Hang the expense!"
They say, "Hang Wakefield"

The F. W. WAKEFIELD BRASS COMPANY • Vermilion, Ohio

Wakefield Over-ALL Lighting



GRENADIER



STAR



COMMODORE



WAKEFIELD CEILING



YOUR BEST BUY IN INSULATION TESTERS MODEL B-7 MEGOHMER



COMBINED PRECISION OHMMETER & MEGOHMMETER
0-20, 0-200 MEGOHMS. 0-200, 0-20,000 OHMS.
Reads as low as 1/10 of 1 Ohm to as high as
200 Megohms. 2 Test Potentials 250/500
Volts. No cranking, no wavering of pointer.
Saves time and effort. Simplifies Insulation
Testing. Ideal for low resistance testing too.

WRITE FOR NEW BULLETIN 440

HERMAN H.

ST PAUL PLACE

Stricht

COMPANY, INC.

NEW YORK 17, N. Y.

WHY GET UPSET WHEN MOTORS BREAK DOWN?

We give you immediate delivery and rock-bottom prices on

ELECTRIC-MOTOR PARTS

for Brown & Brockmeyer • Delco • Jack &
Heintz • Leland • Marathon • Radmond
Sunlight • Wagner • Westinghouse—motors

"Service Doesn't Falter When It Comes From Harry Alter"

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Wholesale Only

Write for Catalog—on your letterhead—to

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Chicago, Illinois

134 Lafayette St.

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YOUR
KEY TO
BETTER SPLICES

Panther

Dragon

SPECIFICATION
FRITITION TAPE 80% BY ROLL 1/8"

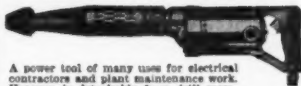
The tape with the yellow core
made by OKONITE
SOLD ONLY THROUGH
RECOGNIZED WHOLESALE

Ask for them by name...

Panther and Dragon
friction and rubber tapes

WHERE TO BUY

WODACK "DO-ALL" ELECTRIC HAMMER



A power tool of many uses for electrical
contractors and plant maintenance work.
Hammer is detachable from drill num-
ber. Drills concrete 3/4" to 1 1/4" diam-
eter, metal to 3/8" and wood to 3/4". Forged hammer
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materials. Attachment for right angle drilling.

Ask for BULLETIN 485-EC

Wodack Electric Tool Corp.

4627 W. Huron St.

Chicago 44, Ill.

Your inquiry

will have

Special value . . .

If you mention this magazine, when
writing advertisers. Naturally, the
publisher will appreciate it . . . but,
more important, it will identify you
as one of the men the advertiser
wants to reach with this message
. . . and help to make possible en-
larged future service to you as a
reader.



MAINTENANCE of industrial lighting
was discussed by two authorities on this
subject at the three-day Industrial Elec-
tric Exposition held in Pittsburgh, Pa.,
in October. R. G. Edsall (left), Works
Electrical Engineer, Westinghouse Elec-
tric Corp., and H. L. Scott, electrical con-
tractor of Corpus Christi.

Two afternoons were devoted to
technical conferences, with three
speakers on the first conference, de-
voted to "Application of Industrial
Electrical Apparatus", and four speak-
ers on the second conference, devoted
to "Maintenance of Industrial Elec-
trical Apparatus". Also, on the first
evening program, E. T. Long, chief,
senior staff engineering bureau of the
Carnegie-Illinois Steel Corporation,
talked on "Automatic Self-Centering
Rolls and Pulleys" and demonstrated
operating models.

The several dominating factors
which the user should seriously con-
sider in the selection of a particular in-
dustrial lighting system were explained
by Benjamin S. Benson, Jr., chief
illuminating engineer of the Benjamin
Electric Mfg. Co., Des Plaines, Ill.

A practical demonstration of cir-
cuit breaker effectiveness in protect-
ing electrical equipment was given by
S. C. Hunt, sales director, Safety
Switch and Breaker Division of the
Square D Company, Detroit.

Fault currents on branch and
feeder circuits of industrial installa-
tions, and what can be done by han-
dling them with fuses, was discussed
by H. F. Williams, central division
manager of Bussman Mfg. Co.

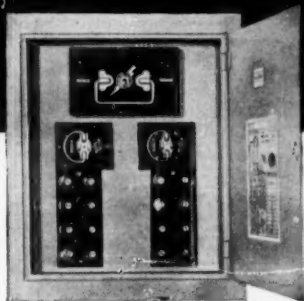
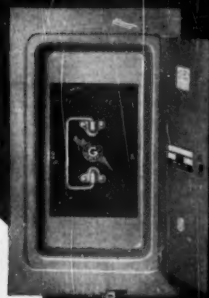
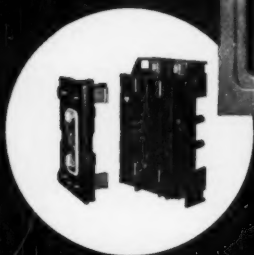
The use of glass in baking or dry-
ing operations, where large area radi-
ating surfaces are required, were ex-
plained by W. W. Shaver, physicist,
and director of product development,
Corning Glass Works.

Industrial lighting maintenance and
its importance in plant production was
discussed by R. G. Edsall, works elec-
trical engineer, Westinghouse Elec-
tric Corporation, East Pittsburgh, Pa.
Subject of his talk was "Planned
Maintenance of Industrial Plant
Lighting."

The latest addition to **General's** complete line of Pullout Switches

100 AMP. PULLOUT SWITCH —Dead-Front Construction—

Cat. No. 1100
Flush or Surface



Cat. No. 1163-16
1166-16

General's 100 Amp. fusible pullout switch is modern in design, attractive in appearance and sturdily constructed of top-quality materials for long dependable service—ideal as an over-all main disconnect switch.

The head and base are integrally constructed of bakelite with heavy wall sections to withstand repeated stresses without cracking. The pullout head fits neatly into the base, making positive electrical contact with a minimum of effort. ON and OFF markings permit foolproof identification of switch position.

Available in flush or surface mounting. The surface type is fitted with single fastening screw and sealable spring latch. Adequate knockouts, abundant wiring room—finished in durable gray baked enamel and packaged one to a carton.

Dead-front construction for greater safety and costs no more than externally operated switches.

Ask your wholesaler for **General** Cat. No. 1100 and look it over—learn for yourself why "The switch is to **General**."

The 100 Amp. over-all main disconnect switch will also be available in combination with 12 or 16 single plug fused branch circuits and two pullout branch switches (30 or 60 Amp.) for Range and Clothes Dryer, Water Heater or similar applications.

Ask your wholesaler or write today for your copy of *General's* Supplement #911 and Price List C 3009.



General
Switch Corp.

49 Roebling Street

Brooklyn 11, N. Y.

One of the leading Manufacturers of:

SERVICE EQUIPMENT . . .

Pullout, Front Operated Toggle and Side Operated types.
Indoor—surface or flush, and Outdoor.

ENCLOSED SAFETY SWITCHES . . .

30 through 1200 Amp., 250 V and 600 V Type A, C and D.
Indoor and outdoor. HP rated.

BRANCH—CIRCUIT PANELS

SALES OFFICES IN EVERY MAJOR CITY

ELECTRICAL ESTIMATING

1 Give information you need to estimate the cost, on any electrical construction job. Covers everything from selection and training of electrical estimators and proper use of estimating tools, to cost of preliminary estimates and preparation of final bid sheets. Discusses estimating forms, tools, study of plans and specifications, listing and checking material quantities, checking completed estimates, etc. Sample estimates of actual construction costs make this book a "must". By Ray Ashley. 307 pages. Over 100 charts and photographs. \$7.50.



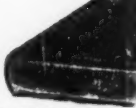
NATIONAL ELECTRICAL CODE HANDBOOK

2 Now contains 1949 supplement to the Code. Gives rules and requirements of all jobs; what they mean—how to apply them in accordance with the latest National Electrical Code. All rules for a job are grouped in one place. Covers definitions of Code terms and requirements applying to all wiring systems. By A. L. Abbott. 6th Edition. 633 pages, 421 illustrations. \$5.00.



ELECTRICAL APPLIANCE SERVICING

3 Gives principles, tested methods and techniques, and practical servicing instructions for all who want to gain an expert knowledge and ability to service and repair any kind of household electrical appliance. Supplies step-by-step guidance on electrical and mechanical fundamentals, and repair methods for resistance heating appliances, motor driven appliances, and refrigeration and air conditioning units. By William H. Croase. 224 pages, 727 illustrations. \$7.50.



TRANSFORMER PRINCIPLES AND PRACTICE

4 Revised up-to-date book dealing with the construction and use of transformers, including underlying principles, applications, connection, testing, care and economics. Gives pointers on polarity, ratio adjustment, transformer oil, mechanical forces, etc. Includes material on current-limiting reactors and new construction. By J. B. Gibbs. Second Edition. 232 pages, 205 illustrations. \$4.00.



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This offer applies to U. S. only

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EQUIPMENT
USED OR RESALE

UNDISPLAYED

\$1.20 per line, minimum 4 lines. To feature advance payment count 5 average words as a line. **INDIVIDUAL EMPLOYMENT WANTED** undisplayed advertising rate is one-half of above rate, payable in advance.

Box Numbers—count as one additional line. Discount of 10% if full payment is made in advance for 4 consecutive insertions.

New Ads Received by December 15th at the New York office, 330 W. 42nd St., New York 18, N. Y., will appear in the January issue subject to limitations of space available.

—RATES—

DISPLAYED

Individual spaces with border rules for prominent display of advertisements.

The advertising rate is \$11.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

An advertising inch is measured 1/8" vertically on one column, 3 columns—38 inches—to a page. E.C.M.

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St., (18)
CHICAGO: 530 N. Michigan Ave., (11)
SAN FRANCISCO: 68 Post St., (4)

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OUTSTANDING ELECTRICAL contracting concern has openings in home office for two electrical engineers. Require high caliber men capable of managing large projects already booked, estimating and assisting in the general conduct of the business. These are permanent connections of extraordinary opportunity. Previous electrical construction experience essential. Write address below giving experience in detail and stating salary expected. Allegheny Industrial Electrical Co., 275 Sixth Avenue, Pittsburgh 19, Penna.

SELLING OPPORTUNITY WANTED

LONG ISLAND, New York. New supply distributor with largest show-rooms in Long Island now open for electric supply lines (no appliances) of national reputation. Covering Long Island only. Open this vast new territory of 1 million people. Large Warehouse facilities; experienced staff; central location. RA-8255, Electrical Construction & Maint.

ESTIMATING SERVICE

Any Trade and Type of Project
Literature and Sample on request
CONSTRUCTION SURVEY COOPERATIVE
101 Park Ave., New York 17, N. Y.
Murray Hill 5-7317 Founded 1922

WATTHOUR METERS

Large Stock - Reconditioned - Guaranteed Single-Phase, Polyphase and DC—Write for Bulletin.

MASPENOCK ELECTRIC LIGHT CO.
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NEW

Guaranteed Rebuilt
MOTORS-GENERATORS-CONTROLS
NOW IN STOCK

We buy surplus equipment

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BUYERS OF SURPLUS COPPER INSULATED WIRES AND CABLES

No lengths too long or too short

Telephone: Eastgate 7-4778

PIERCE CABLE CO.

2664 Clybourn Ave. Chicago 14, Illinois

ELECTRICAL CABLE

- for every Industrial and power application.
- Special constructions. Odd lengths.
- Large stocks on hand of high voltage, lead covered cables not ordinarily stocked by your regular suppliers.
- Cut to length. Reasonably priced.

UNIVERSAL Wire and Cable Co.
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Bought and Sold

New and Rebuilt

ELECTRIC EQUIPMENT CO.

BECHTOLD 1 N. Y.

MOTOR STARTERS—Size 1

Brand new A.C. 3 pole, 208-220v. 60cps coil; 20amp heaters.

1-10 \$19; 11 up \$15; all 130 \$11 ea.

FOB 3966 Lexington Av. St. Louis, Mo.

ELECTRO DEVICES INC.

3966 Lexington Avenue, St. Louis, Missouri

BOOKS

ELECTRICAL CONTRACTORS ESTIMATING HANDBOOK

"A Unique Tool of the Trade"

WRITE FOR DESCRIPTIVE FOLIO TO
THE ESTIMATOR PUBLISHING CO.
1805-B 60th St. Kenosha, Wis.

IF THERE IS

Anything you want

that other readers of this paper can supply

OR—

Something you don't want

that other readers can use, advertise it in the

SEARCHLIGHT SECTION



OUTLET BOX HOLDER

FOR WALLBOARD AND
PLASTERBOARD WALLS



"Patent Number 2514176"

WILL withstand a pull of 105 lbs. before breaking through one thickness of plasterboard, as witnessed and certified by the United States Testing Company of Chicago. Made to accommodate up to two thicknesses of plasterboard or 3 thicknesses of wallboard. Available also for multiple unit boxes.

HONER MFG. CO.

512 S. GREEN ST.

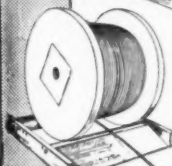
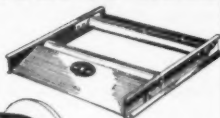
CHICAGO 7, ILL.

Time to Discard OLD-FASHIONED WAYS



Jacks . . . props . . . shores . . .
horses . . . why fool with these
obsolete methods of handling
reels? DO IT THE MODERN,
EFFICIENT WAY! Reel or
unreel wire, cable, rope with

ROLL-A-REEL



Simple, strong, easily
handled stand for
your reels to
save time and labor.
Adjustable slots for
variety of reel sizes.

Style A: 2,000 lbs. cap. 37.50
Style B: 4,000 lbs. cap. 75.00
f.o.b. Cincinnati

WRITE FOR DETAILS TODAY

ROLL-A-REEL

327 WEST FOURTH STREET
CINCINNATI 2, OHIO

"Maintenance and the Qualified Contractor" was the title of a talk presented by H. L. Scott, Scott Electric Company, Corpus Christi, Texas.

Thomas E. Hughes, general foreman of the Electric Shops and Motor Rooms of the Homestead District Works, Carnegie-Illinois Steel Corp., talked on "Electrical Maintenance in a Large Steel Plant".

Dates Ahead

Plant Maintenance Show and Conference—Cleveland, Ohio, January 15-18.

International Heating and Ventilating Exposition—Commercial Museum, Philadelphia, Pa., January 22-26.

American Institute of Electrical Engineers—Winter General Meeting, New York, N. Y., Jan. 22-26, 1951.

National Electric Sign Association—Hotel New Yorker, New York, N. Y., February 5-7.

The Power and Communication Contractors Association (formerly NECA)—Annual Convention, Edgewater Beach Hotel, Chicago, Ill., Feb. 4-6.

North Central Electrical Industries—All-Industry Convention, Hotel Nicolet, Minneapolis, Minn., Feb. 25-28.

Electrical Maintenance Engineers Association of Southern California—Fifth Annual Industrial Electrical Show, Shrine Convention Hall, Los Angeles, California, March 15-17.

Edison Electric Institute—17th Annual sales conference, Edgewater Beach Hotel, Chicago, Ill., April 2-5.

Chamber of Commerce—39th Annual meeting, Washington, D. C., April 30-May 2.

National Fire Protection Association—Annual Meeting, Detroit, Mich., May 7-11.

Edison Electric Institute—Denver, Colo., June 4-7.

Illuminating Engineering Society—National Technical Conference, Hotel Shoreham, Washington, D. C., August 26-September 1.

NEW CONSTRUCTION? REPLACEMENT? EMERGENCY?

DEMAND

STOCKWELL TRANSFORMERS

(Oil Filled and Dry Type)

FOR

FAST AND RELIABLE SERVICE

Lighting • Distribution • Power
Phase Changing • Special Applications



100 KVA, DISC
Single Phase, 60 Cycle
2400/4160Y—240/480

Write for Further Information.

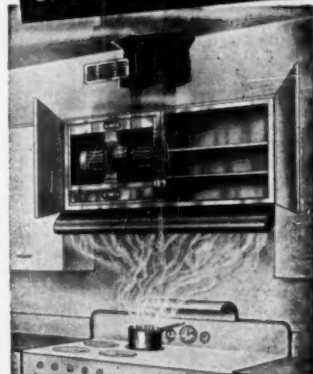
STOCKWELL

TRANSFORMER CORPORATION

569 South Main Street Akron 11, Ohio

The most MODERN kitchen ventilating system

**TRADE-WIND
SUPER CLIPPER
CABINET VENTILATOR**



**Installs in cabinet
over range...double
inlets provide
COMPLETE ventilation**

Only the Super Clipper Kitchen Ventilating System—made by Trade-Wind—exhausts cooking fumes and heat from both the stove and at the ceiling level.

This newest development is installed in metal or wood cabinets directly over the stove. The twin squirrel cage blowers produce 600 CFM—more than sufficient power to trap all cooking heat, grease and odors from the range top as well as through the second inlet at the ceiling. The motor is equipped with a 2-speed control. Two metal air filters are provided. Both a fold-under hood and stationary hood are available and both are optional.

No other kitchen ventilator can do the complete job that the Super Clipper accomplishes. And no other ventilator offers the architect, the builder and the home owner the versatility and efficiency which the Super Clipper provides for the modern kitchen.

*Several manufacturers now build metal cabinets especially for the Super Clipper. Wood cabinets can also be built on the job. Trade-Wind does not provide the cabinet.

Write today for complete information.

**TRADE-WIND
MOTORFANS, INC.**

5709 S. Main St., Los Angeles 37, Calif.

3

**1 to 42
CIRCUITS**

SQUARE D MULTI-BREAKERS

for Lighting and
Appliance Loads



Coilless
THERMAL—MAGNETIC. Thermal element deflects in proportion to temperature of wire insulation resulting from both surrounding air and losses within the conductor. **Magnetic** element responds instantly to heavy overloads or shorts. Both are needed for complete protection.

REPEAT PROTECTION. Nothing burns out . . . nothing to replace. No live parts are exposed. Anyone can quickly restore service.

NON-TAMPERABLE. Factory test-tripped and sealed. Eliminates well-intentioned but dangerous "doctoring" to accommodate higher loads.

SWITCHING. Circuits can be manually switched "ON" or "OFF" in addition to the automatic "TRIP" and manual "RESET" protective functions.

CONVENIENCE. Multi-breakers are attractive and occupy very little space. Mount them in any location. Provide for future expansion.

Write for Bulletin SA590. Square D Company,
6060 Rivard Street, Detroit 11, Michigan.

flexible

Basic multi-breaker mechanism lends itself to either single or multi-pole construction.

Types MO 1, MO 2 and MO 4 for branch circuits and small homes where high volume and low cost are controlling factors. Similar parts are assembled in 1, 2 and 4 pole blocks.



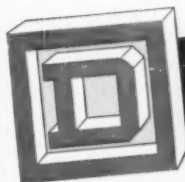
Type MO 8 for average homes. 4 pole basic block meets minimum requirements. "Ad-On" single pole breakers increase total to 5, 6, 7 and 8 circuits as required.



Types MO 12 and MO 20 for larger homes. "Plug-In" 2 or 4 pole breakers cover the range of 4 to 20 circuits.



MO Panelboards and NMO Panelboards extend range to 42 circuits for stores, institutions, buildings and factories.



SQUARE D COMPANY

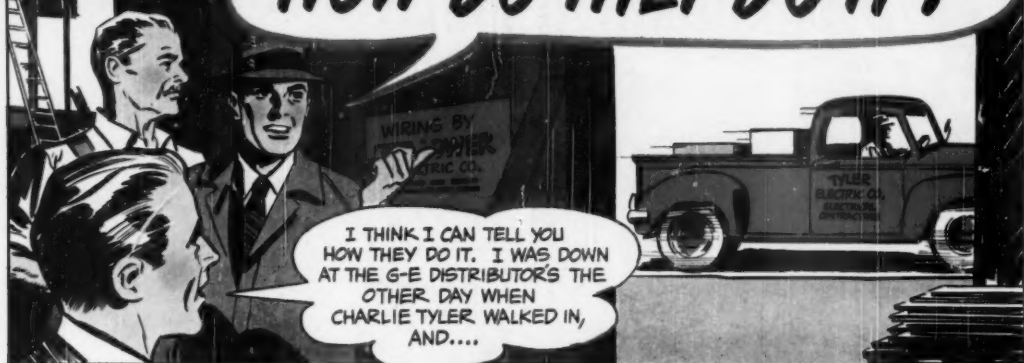
DETROIT

MILWAUKEE

LOS ANGELES

SQUARE D COMPANY CANADA LTD., TORONTO • SQUARE D de MEXICO, S.A., MEXICO CITY, D.F.

ANOTHER NEW TRUCK FOR TYLER! HOW DO THEY DO IT?



I THINK I CAN TELL YOU HOW THEY DO IT. I WAS DOWN AT THE G-E DISTRIBUTOR'S THE OTHER DAY WHEN CHARLIE TYLER WALKED IN, AND....

HI, CHARLIE! STILL THE BIGGEST G-E BOOSTER IN TOWN?

ABSOLUTELY! AFTER ALL, I'VE BUILT MY REPUTATION ON GENERAL ELECTRIC. MY CUSTOMERS KNOW THE G-E NAME, AND I KNOW I CAN TRUST G-E PRODUCTS.

AND, YOU KNOW, CHARLIE, YOU'RE KEEPING YOUR INVENTORY DOWN BY HANDLING ONLY G-E PRODUCTS.

RIGHT AGAIN. I DON'T NEED TO STOCK ITEMS FROM HALF A DOZEN MANUFACTURERS. ONE LINE IS ALL I NEED.

WHILE I'M AT IT, I MIGHT AS WELL ADMIT THAT I LIKE YOUR SERVICE. YOU AND THE GENERAL ELECTRIC FIELD MAN HAVE HELPED ME OVER A LOT OF ROUGH SPOTS... SAVED ME A GOOD MANY HOURS ON PROBLEM JOBS.

NOW THAT WE'RE THROUGH TOSsing OUT BOUQUETS, WHAT CAN I SELL YOU?

HERE'S MY ORDER. AND MAKE SURE IT'S ALL GENERAL ELECTRIC.

SO, THAT'S THE SECRET OF TYLER'S SUCCESS. IT'S G.E. FOR ME FROM NOW ON.

THANKS FOR YOUR HELP. YOU'LL BE SEEING A LOT OF ME!

ANY TIME. AND WHILE WE'RE TALKING ABOUT GENERAL ELECTRIC SERVICE, YOU'LL BE INTERESTED IN THIS NEW AVA CABLE BULLETIN. TAKE A COPY WITH YOU.

FOR UP-TO-THE-MINUTE INFORMATION ON G-E WIRES AND CABLES...G-E CONDUIT PRODUCTS...G-E WIRING DEVICES, SEE YOUR GENERAL ELECTRIC CONSTRUCTION MATERIALS DISTRIBUTOR.

OR WRITE TO SECTION L2-1218 CONSTRUCTION MATERIALS DEPT., GENERAL ELECTRIC CO., BRIDGEPORT 2, CONN.

GENERAL  ELECTRIC

 CONSTRUCTION MATERIALS DEPARTMENT